ANNALS

OF

OTOLOGY, RHINOLOGY

AND

LARYNGOLOGY.

VOL. XVI. JUNE, 1907. No. 2.

XX.

THE TREATMENT OF FOREIGN BODIES IN THE RESPIRATORY TRACT AND ESOPHAGUS.*

AN ADDRESS DELIVERED BEFORE THE AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY, AT THE THIRTEENTH ANNUAL MEETING HELD AT NEW YORK CITY, MAY 30, 1907.

By Prof. Gustav Killian,

Freiburg in Breisgau.

Gentlemen:

The invitation of your President to deliver an address on the treatment of foreign bodies in the air-passages and esophagus is accepted with great pleasure, inasmuch as it relates to a method of examination in behalf of which I have, for the past ten years, been making an earnest propaganda, in the desire to benefit the afflicted by its general dissemination.

*Translated by Hanau W. Loeb, M. D., St. Louis.

RESPIRATORY TRACT.

I need not say much with reference to the upper respiratory tract. We are often called upon to treat foreign bodies in the nasal cavities, especially in children. As a rule, they are buttons, beads, etc., made out of various materials, cherry-seeds, beans, peas, and occasionally a forgotten cotton tampon. Nasal calculi also belong to this class.

Once I was called upon to remove a free osteoma, of the size of a hazel-nut, which had been left in the nasal cavity after an operation performed the year before, and which rolled to and fro with the movement of the head. It was incomprehensible how the patient could endure the condition so long. Another case was that of a child who accidentally ran a splinter into his nose. Another infant was brought to me suffering from very high fever, bad smelling nasal discharge, and swollen glands, resulting from a paper plug which his sister had stuck into his nose some time before. That the severe clinical picture depended upon this was shown by its disappearance after removal. Finally I must mention a case in which a wooden plug, as thick and long as the little finger, was shot through the maxillary sinus, passing into the nose and perforating the septum.

Foreign bodies in the nasal cavities in children are generally found in the vicinity of the vestibule, if no unskillful efforts at removal have been made. In one of my cases, the ethmoid bone was penetrated as far as the orbit in the fruitless search for the foreign body. Inflammation symptoms may follow such efforts, which may make the discovery of a foreign body very difficult.

The simplest and the most common method of removal is to introduce a thick nasal probe, bent forward, beyond the foreign body, and then draw it from behind forward and remove it. The little patient often, involuntarily, assists in this by moving the head backwards. A strong pair of toothed forceps is the best instrument to use for large impacted foreign bodies. When necessary, a great amount of strength may be used with this instrument, so that the foreign body may be extracted with certainty.

So far as foreign bodies in the accessory cavities of the nose are concerned, the maxillary sinus is the principal site. They are generally trochars and drainage tubes which are shoved into artificial openings. Occasionally, roots of teeth or por-

tions of bone, remaining after operation, are found. I have often succeeded in locating and extracting a drainage tube through an alveolar fistula by means of a nasal speculum. I have occasionally removed such objects while performing the radical operation.

Foreign bodies are seldom found in the epipharynx. I was once called upon to remove a collar button which I had drawn out of the larynx, under narcosis, with the head hanging downwards; it slipped from me and fell into the epipharynx. Its removal was more difficult than I had anticipated.

In the mesopharynx and hypopharynx, fishbones are most frequent. They are found in the region of the tonsils, sometimes at the base of the tongue, and rarely in deeper positions. They are readily removed with forceps. Pieces of bone may be lodged in the sinus pyriformis. I was called upon to remove a splinter of bone, sharp at both ends, which was stuck in this place, causing the patient to have severe symptoms, though it was not discovered by the physician in charge. In another case, deep pharyngeal and laryngeal abscesses, resulting from a chicken-bone sticking in the sinus pyriformis, were spontaneously evacuated and cured.

Foreign bodies in the larynx constitute an extensive and interesting chapter of our subject, but are not so common as generally supposed. As a rule the foreign body immediately travels further down. Sharp and uneven objects are most apt to be caught in the larynx: needles, fishbones, bone splinters, shell of nuts. Once I saw half of a dental plate lying there.

The laryngoscopic method of extraction has, in this particular, achieved a great triumph. It may be called the normal method for adults, as long as the foreign body is not firmly wedged in. In children, the removal through the agency of the laryngoscope is very difficult, and though it may be successful under narcosis, still our old time technic has its limitations. It entirely fails when the foreign body is tightly wedged in. The smaller the child, the greater the difficulty. It was formerly necessary to take refuge in laryngofissure, but now we have the additional advantage of direct laryngoscopy, which makes laryngofissure superfluous in the majority of cases. In all doubtful cases in children, I should recommend the practice of entering directly with the tube, under narcosis, and with the head hanging down.

The number of cases treated so far in this way is small (Denker, Garel, Guisez, De Stella, G. Killian), but it justifies the greatest hope for the future. I recommend you to use my tipped tube spatula. The base of the tongue is drawn forward with it and the epiglottis and inner surface of the larynx are cocainized. Under narcosis, this is done with the head hanging down. The spatula is then passed over the epiglottis which is thus drawn forward. By suitable illumination with an electric forehead lamp (Kirstein's) or with an electric extension lamp, a beautiful view into the larynx is obtained not only as far as the vocal bands, but also into the subglottic space and deeper, provided the local and general anesthesia is sufficient. Foreign bodies can be readily seen and removed with suitable forceps. If the process is made difficult by the mucus that collects, this is removed by my pump (which has lately been modified by my assistant, Brünings). Anyone who has had experience can, under certain conditions, avoid tracheotomy, in recent cases, if the danger of suffocation is not too great, by rapid performance of direct laryngoscopy, as Denker succeeded in doing in one case.

FOREIGN BODIES IN THE TRACHEA AND BRONCHI.

I come now to the treatment of foreign bodies in the trachea and bronchi. In these, the direct method has the field entirely. The results have been extraordinarily successful. Since 1897, when I reported my first case in the Münchener med. Wochenschrift, until the end of March this year, 164 cases have been reported. (I count only the cases in which a foreign body was actually present.) To my certain knowledge, however, there are a large number of cases still unreported, so that altogether there are 200 or more. Practitioners have made themselves familiar with the new method in most civilized lands. It was very early and ardently employed in the United States.

In order to reach a foreign body in the trachea or bronchi, it is necessary to introduce a tube of proper caliber and proper length through the glottis, that is, to perform upper direct tracheo-bronchoscopy.

The tube should be chosen just wide enough to pass smoothly through the larynx. In adults, its caliber should be from 9 to 14 mm., and in children, as a rule, it must be reduced to

7 mm. Very small children require tubes of 5 mm. or less in diameter. The length of the tube should correspond, in adults from 30 to 40 cm., in children from 20 to 30 cm., or even less. The actual measurement for the removal is to be taken from the upper row of teeth to the point where the foreign body lies, with the head bent back. This is easily ascertained before the operation.

The variations in the age of patients, the size of their bodies, the width of the larynges, and the location of the foreign bodies are so great that a great many different tubes must be kept on hand. Furthermore, it sometimes happens that a change from a longer or shorter tube is necessary during the operation. In order to secure a desirable simplicity in this particular, I have effected the lengthening of the tube by introducing secondary tubes. The sliding tubes of Brünings, which I now show, have been constructed accordingly and are very efficient for this purpose. They are composed essentially of a tube spatula, through which a second tube may be pushed as far as desired. An equipment of five or six of these tubes is sufficient for all adult cases. A regulator, attached to the lateral wall of the tube spatula, controls the introduction of the tube. The tube spatula is readily inserted and passed through the glottis. We can easily introduce the sliding tube any distance from the middle of the trachea to the bronchi of the lower lobes. Two lateral openings in the sliding tube renders respiration easier. They are especially necessary when it is desired to introduce a tube, filling the larynx, into a branch bronchus, where the lung tissue is not sufficient for the purpose of respiration (shut off by foreign body or tissue changes).

Good local and general anesthesia must be secured in order to introduce such a tube into the deeper air passages. A hypodermic of 0.01 to 0.02 grams of morphin is given to adults a half hour before; in children, the internal administration of codein, five to fifteen drops of a one per cent solution, according to age, will be advantageous.

When no narcosis is to be employed, the larynx and trachea are cocainized by the aid of a mirror while the patient is in the sitting position. In this connection, the epiglottis may be pulled so far forward that a cocain applicator, extended perpendicularly, introduced through the mouth, with the aid of a mirror, will glide over the posterior wall of the

larynx into the deeper parts. This procedure may also be undertaken by direct laryngoscopy or by the aid of the finger. Wherever I use general narcosis, I cocainize only after it is sufficiently deep. Then the mouth speculum is introduced, the tongue seized with the forceps and pulled forward and cocainization is made by means of the tipped tube spatula, as before stated.

It is best, in performing direct bronchoscopy for the removal of foreign bodies, to have the patient in the recumbent position, whether or not a general anesthetic is used. In this way all the disturbances, so easily called forth by the accumulated saliva and mucus, are suppressed.

The patient should be placed so that the foreign bodies lie at the highest level and the head at the lowest, since in this way the clearest field of view is obtained. Generally, I have the patient lie on his back, but lately I have begun to place him on his side, which seems to be the most advantageous position.

It is a great mistake to bend the head too far back at the introduction of the tube spatula. One should begin with a moderate bending of the head backwards and increase this during the procedure as far as occasion demands. The tube spatula is introduced through the angle of the mouth from the opposite side, if the situation of the foreign body is known. The epiglottis, arytenoids and vocal bands are sought and the instrument is then passed between them into the trachea. If the cocainization has been sufficient, there will be no interference at the glottis.

After the deeper portions and the bronchus especially have been carefully cocainized (without pushing the foreign body deeper), the sliding tube may be introduced first to the bifurcation and then into the affected bronchus. It should be advanced until it reaches the neighborhood of the foreign body which is often covered with mucus and granulations or but slightly visible. It is then necessary to suck up the secretion with the pump. The granulations must be carefully treated so that no hemorrhage from in front occurs.

If the foreign body does not lie in a position where it may be easily removed, the neighboring mucous membrane should be made anesthetic by the application of cocain on a small cotton carrier or by a cocain spray (weak solution) inasmuch as this region is very hyperesthetic. The slightest movement

of the foreign body causes severe paroxysms of coughing. The greatest difficulty results from neglecting to cocainize in this way, for it is clear that everything else has been made anesthetic, especially the whole passageway to the foreign body, except the mucous membrane directly adjoining.

The procedure is much simpler in tracheotomized patients whether tracheotomy has already been performed or whether we ourselves have been forced to perform it on account of the severe dyspnea, or must perform it because the extraction cannot be accomplished by the upper method.

Lower direct tracheo-bronchoscopy seldom requires general anesthesia. Simple cocainization of the tracheo-bronchial mucosa is sufficient. Larger and shorter tubes may be used. For the reason already stated, it is best to have the patient in the recumbent position. As a rule, Brünings' new instruments are the best adapted for lower tracheo-bronchoscopy.

The extraction of foreign bodies is a subject in itself. No general rule can be laid down, but each case is a law unto itself. It depends upon the character of the foreign body, its position and the condition of the neighboring structures. The whole mechanism of extraction often requires thorough deliberation and experience is most advantageous.

I have thought that it would be of most service to you if I gave you the results not only of my own methods, but also those of others, and even those of prebronchoscopic times. I have, therefore, thoroughly studied the literature and I give you the results condensed.

We will pursue the subject better if we divide foreign bodies into groups and establish the best and most certain methods of extraction for each. In this way the novice may quickly obtain the most complete information regarding a given case and may guard himself against serious mistakes. Above all, it will be of value to him to accustom himself to the proper use of the most reliable instruments for extraction.

Foreign bodies are best divided into two groups from the standpoint of the extraction (this is practical and most important).

I. Hard.

II. Not hard.

HARD BODIES.

The hard variety have in common a definite size, form and surface quality. I first separate those which extend mainly in

one direction: Needles, fishbones, nails, screws, and steel pens. Then follow those which are extended in two dimensions: Flat bodies like coins, pebbles.

Bodies with three dimensions; with smooth surface such as beads, cherry-stones, coffee-beans; those with uneven surface and contour, as prune-stones, pieces of bone, etc.; those with irregular form such as teeth, pieces of metal, metallic objects of different types but typical form, and collar buttons. I include artificial dentures in this group.

Hollow bodies of different materials and of the widest variety constitute a separate group.

BODIES NOT HARD.

Bodies with consistency from wood to cork have an intermediate place. Fruit seeds, which are easily broken, are placed in an individual class, likewise the semi-soft vegetable seeds. Then come the really soft bodies, which must be considered individually, for instance, cereal spikes and especially seeds which are likely to swell (beans, etc.).

Needles.—Sprengel, 1; G. Killian, 2; Garé, 1; Ingals, 2; Coolidge, 2; Gottstein, 1; Lombard, 1; Elsberg, 1; Brokaw, 1—12 cases.

Those which were inspired were usually of the sewing-needle variety, though in one instance it was a Pravaz syringe needle. The patients, as a rule, are adults, which makes the removal much easier. As needles cause only slight pulmonary symptoms, there is no necessity for immediate extraction, so that if success does not attend first efforts there is no special danger in waiting and the necessary procedure may be repeated.

It is a very valuable circumstance that the Röntgen picture is usually positive, showing the exact site and position of the needle. We can, as a rule, be certain that the head of the needle lies downward and that the point sticks upward and sidewise. Its fixation, as a rule, is only slight. The point does not simply stick into the mucosa; it is usually surrounded by granulations or has caused a small abscess. As there are only slight disturbances of the bronchial mucous membrane, the examination will not be made difficult by mucus; on the other hand, we must remember that there is a great hyperesthesia in the neighborhood of the needle which must be overcome by careful cocainization.

Needle cases are more suitable for upper bronchoscopy than any others, for the reasons given. Lower bronchoscopy is required only in extraordinary cases. Our report of cases gives no proper light as to the future, because tracheotomy has been too frequently performed, since upper bronchoscopy was not sufficiently trusted by operators.

My first case certainly constitutes an exception. I made a sincere effort to find the needle by upper bronchoscopy without result, and likewise lower bronchoscopy, although the X-ray picture was positive. Ten years had intervened since the needle had entered the trachea, and therefore it might have been imbedded anywhere in the lung tissue.

When the needle is brought into good view and the position of the point ascertained by means of the tube, it is easily grasped near its point by von Eicken's right angled short-jawed forceps and freed from the bronchial wall by a slight backward motion and then drawn outward through the tube. If the forceps slips off the smooth metal, it may be covered with a thin rubber pad. The needle may also be freed from the bronchial wall by pressure of the rim of the tube over the place where the needle has penetrated.

All the cases cited above were followed by good result; in but one case (Lombard) was the cure delayed by pneumonia.

Fishbones generally are caught higher up and seldom reach the trachea or bronchi. Only two cases were observed by means of the bronchoscope, one by my brother and the other by Gottstein. Both were in young children, 3½ and 1 year. In the first case, upper bronchoscopy, under general anesthesia, was of excellent service. The bone was readily removed with a hook and the child rapidly recovered. Tracheotomy was necessary in the second, on account of threatening suffocation. The bone, which was subglottic at the beginning, was found by means of lower direct tracheoscopy to be in the trachea, from which it was easily removed.

Nails. (Cases of Lindt, H. v. Schrötter, v. Mikulicz, Coolidge, Helferich, Neumeyer, Guisez.)

We have in these cases to act, in general, as with needles, as the conditions are exactly the same. The head lies, as in the other instance, generally below, easily demonstrated by the Röntgen picture. They are generally found deep in the right bronchus.

The patient is asked to show a nail similar to the one in the bronchus, for the purpose of orientation. As a rule, upper bronchoscopy and von Eicken's forceps will be successful. The latter has the value of drawing from the side so that one may see what is being done. Of course good results may be obtained with any suitable straight forceps. The electro-magnet is of use only when the nail is very small and deeply lodged, as happened in two cases. A rod shaped electro-magnet is necessary so as to permit its introduction deep into the tube.

Steel Pens (Cases of Borchardt and Gottstein) are to be treated in a similar way.

Coins (Cases of Killian-Worms, Coolidge, Guisez, 3) have been found in the deeper air passages only in adults. They are apparently too large for children and are therefore usually swallowed. Coins are flat bodies and lie usually diagonal to the bronchial lumen. The current of inspired and expired air apparently seeks to keep as broad a passageway as possible both from above and below by the side of the easily moved coin. Our extraction instruments in the form of forceps are particularly useful in drawing out diagonally placed flat bodies. It is therefore to be expected that good results will follow the use of upper bronchoscopy with proper technic, as was demonstrated in the cases above cited.

Pebbles. (Cases of G. Killian, von Eicken, Kahn, Pieniazek.) The inspiration of pebbles is a specialty of children from 2 to 6 years of age, who like to put such things in the mouth. They are partial to flat, smooth stones which require the same method of extraction as coins. Smooth stones present, however, greater difficulties. The pebbles selected by children are generally so large that they cannot fall deep into the bronchus, but remain at its entrance and often partially in the trachea. They do not cause irritation and, therefore, there are little disturbances from secretion; accordingly, they may be readily reached and removed with my bean forceps, by means of tracheoscopy under general anesthesia. All the cases known up to the present time have been rapidly and successfully relieved (from two hours to one day after inspiration). Those treated by means of upper bronchoscopy were able to go home after the effects of the anesthesia had disappeared.

Glass Beads, Cherry-Stones, Coffee-Beans.—Noltenius, Jackson, and Pasteur observed cases in which glass beads,

glass buttons, and shoe buttons were found in the deeper air passages. These bodies have a peculiar property. They continue movable for a longer time in the trachea, and are only occasionally impacted in the right and left bronchus. They are readily coughed up, but they may be retained for a long time. Only in young children is coughing up through the larynx not so easy. This may, perhaps, be encouraged by cocainization in the subglottic space. If the bead remains, help may be quickly obtained by pushing it downwards with the applicator.

We must remember that, when performing upper bronchoscopy, the bead may be coughed up into the tube, for which reason a wide tube should be used. It is not easy to grasp a moving body in the trachea, so it is best to try to fix it in the neighborhood of the bifurcation and to grasp it there with forceps.

The same applies to cherry-stones (case of Hinsberg) and hard pills (Siebenmann). Coffee-beans (cases of Neumeyer and Fletcher Ingals) are very light and are therefore still more movable than the above, so that they may be coughed up earlier. Upper bronchoscopy is very well adapted for their removal if only a proper instrument can be used. Besides the bean forceps, a fine, sharp hook may be of service.

Prune Stones differ from the preceding by their oval shape, pointed ends, and rough surface, which are favorable for the grasp of the extraction instruments. Three cases have so far been observed by Siebenmann, Kausch and Lafite, but we may expect that sooner or later we will meet with more such cases, as the extraction of prune stones, according to reports, has been quite frequent. They occur in all ages of life. In children, they do not attain any great depth, on account of their size. They remain in the trachea and in the neighborhood of the opening of the main bronchi. This is important to know, as the Röntgen picture is negative.

The chances for upper bronchoscopy are therefore good, as the stone lies diagonally (like coins), leaving on both sides a free space for different kinds of forceps.

Other fruit stones are occasionally found, for instance, the apricot stone in Pieniazek's case.

Pieces of Bone are the commonest foreign bodies observed through the medium of bronchoscopy. There are no less than 31 cases reported. I myself have seen six cases, Kümmell,

Spiess 1, v. Schrötter 3, Gottstein 1, Hug 1, Neumeyer 1, Just 1, Schwytzer 1, Siebenmann 1, Mouré 2, Meyer 1, Kob 1, Pauns 1, Nowotny 1, Hinsberg 1, Henrici 1, Chiari 1, Garel 1, Lehr 1, Lins 1, Pauner 1, Winkler 1, von Eicken 1.

Pieces of bone are much more often inspired by adults than by children (three-fourths of the cases), and of these, mainly those above forty (half the cases). They are seldom found in the trachea, but mainly in the bronchi, especially on the right side. The trachea is more commonly the site in children.

Severe lung changes develop only occasionally directly following aspiration. On the other hand, they do not wait very long if the bone is not removed. The pieces of bone have mostly a rough surface and sharp edges and corners, become impacted and scratch the mucosa. From the small wounds, granulations spring up which enclose the piece of bone, give rise to collections of mucus and pus and destructive processes and help to shut off the dependent lung tissue. Later, putrid bronchitis, bronchiectasis, pulmonary abscess and pulmonary gangrene may appear. The secretion from the lungs under such circumstances is very abundant, making bronchoscopy and extraction very difficult. Besides this, there is a high grade of hyperesthesia of the mucosa in the neighborhood of the foreign body. It is, on this account, important to remove the inspired piece of bone as soon as possible. So far, three-fourths of the cases have been old ones.

The pieces are, as a rule, of flat shape and are 14 to 15 mm. long by 8 to 9 mm. wide. They are so situated that their long diameter corresponds to the axis of the respective bronchus and their horizontal diameter lies across the bronchus. On account of their flat form they resemble coins and are therefore easy to grasp. The granulations sometimes hide the location so that the diagonal position cannot be well made out. It is therefore necessary to clean the field with the pump in order to ascertain clearly the position of the bone. A diagonally placed bone can be easily removed with any kind of forceps.

Cubical Bodies are more difficult to remove. The bronchus may be so filled that no instrument can pass by, except perhaps a fine, sharp hook. For such cases, my assistant, Dr. Brünings has constructed, under my direction, a sharp hook forceps which catches very well, even when only a small portion of the bone can be grasped. It worked very well in the

very first case and it will doubtless be used with rapid result in many other upper bronchoscopies.

The extraction with lower bronchoscopy is naturally much easier. We make use of it when the upper is not available.

The present collection of cases does not give as yet a proper conception of the performance of bronchoscopy since there are too many technically incomplete cases included under the head.

Teeth.—Inasmuch as we have to deal with carious teeth and tooth fragments, the lung results are more severe than in the case of bones which have been sterilized by cooking. When a carious tooth gets into the lungs, severe pulmonary symptoms rapidly follow. Of 14 cases of earlier times, eight died of lung complications, one of which was from actinomycosis. Three of those who recovered went through very severe lung complications.

Such an inspired tooth, therefore, must be removed without delay. Pieniazek removed one from a patient, 40 years of age, by lower bronchoscopy, eight days after the accident. Pneumonic symptoms had already appeared in the right lower lobe, which progressed in spite of the removal, so that recovery was delayed for some time.

Pieces of Metal and Metallic Objects.—Cases of Neumeyer, Paterson, Pieniazek (3), Helfferich, J. Killian, Gottstein, H. v. Schrötter, Kümmel, Fletcher Ingals, Hajek, 12 cases in all, including many children, especially the larger ones who like to play with such things. The special forms of such foreign bodies make the attempts at removal very difficult. Upper bronchoscopy is on this account not always successful. In one instance, the foreign body (a garter clasp) was too large and could not be drawn through the larynx. Inasmuch as the metallic bodies cause no acute lung symptoms, there is time to use upper bronchoscopy several times before the method is given up. Extraction occasionally necessitates special instruments, depending on the form of the foreign body. Brünings' lock forceps, covered with rubber, are suggested for smooth metallic bodies.

Shirt and Collar Buttons are particularly difficult to remove from the deeper air passages especially if the flat part lies above. If it lies diagonally in the bronchus, that is, if its neck is diagonal, it may be readily grasped and extracted, best with a hook. This is placed around the neck and the button is pressed against the end of the tube so that they may be all

removed together (G. Killian, Fletcher Ingals). But when the plate lies above, it is very difficult to pass by the button. It fills the lumen of the bronchus and is covered up by the swelling of the mucous membrane. If the button remains for a longer time, granulations will spring up and, in course of time, decided stenosis may follow. In two cases of the last-named kind (Spiess, Hoffmeister), extraction was impossible. Hoffmeister's case developed pneumonia. Both cases died. I have had the good fortune to remove collar buttons three times, once with upper bronchoscopy, twice with lower. In the last two cases, the requirements for extraction were too great for upper bronchoscopy. In each case, the plate lay above and a great amount of secretion prevented its removal. The first patient, an eighteen-year-old boy, suffered from extensive bronchiectasis; he died from this condition six months later. The other patient was a boy ten years of age. The button, which was made of porcelain, caused severe pulmonary symptoms and indicated immediate extraction. Much time could not be spent with upper bronchoscopy. Lister's hook was in both cases the only instrument which I could use. It was possible to pass by the plate and grasp the button at the neck and thus extract it.

One of my students, Cuthbert Morton, has lately devised a spear-hook by which the plate may be grasped at its edge.

Artificial Dentures, as a rule, are too large to enter the air passages, but if they do, the larynx holds them back. They seldom pass entirely into the deep portion, and then into the left bronchus as in Wild's case. This was a plate with two teeth. It was observed eleven days after the accident by means of upper bronchoscopy and as it was too large for certain removal through the larynx, it was extracted by forceps, by means of lower bronchoscopy.

Hollow Bodies.—Fragments of canulae (Pieniazek, 3 cases; Coolidge, Neumeyer, Narath, each had one case). Hollow bodies of moderate size, pencils and the like (Thost, Neumeyer, Englemann, G. Killian). Small hollow bodies, tin whistles, etc. (G. Killian, Claoue, Guisez). Sundries (Guisez, Durewitz, Kob).

After tracheotomy, the canula sometimes breaks off from the plate and falls down into the trachea or even into the right bronchus, seldom into the left. There is difficulty in extracting the canula by forceps and lower tracheoscopy and bringing it

through the tracheotomy wound. It is best to increase this wound in size. Hooks may be used instead of forceps, if it is the outer tube with an opening in it. The hook is inserted in the opening. In one case, under general anesthesia, respiration ceased, the foreign body having completely shut off the air. The operator (Pieniazek) had the presence of mind and wisdom, in this critical situation, to push the canula down into the right bronchus, by which breathing became at once free. Later, the extraction was easy. Penholders, pencil cases and such hollow bodies, particularly if they are small, as in my case of tin whistle, may cause decided difficulty, especially as they occur in children from 4 to 8 years of age. They are aspired into the bronchi and may be easily seen in Röntgen pictures. Inasmuch as they are smooth metallic bodies, they occasion slight symptoms and do not cause any severe infection of the lungs. The symptoms are naturally milder when the air can pass through the tube.

The foreign bodies may well be reached by upper bronchoscopy, as happened in four out of six cases (G. Killian 2, Neumeyer, Guisez). They may be grasped at the edge with forceps whereby one branch is pushed into the opening and the other between the wall of the foreign body and that of the bronchus. If the edge of the foreign body is covered with swollen bronchial mucosa, it will be better to use my hollow body forceps, which, after being pushed in the opening, spread their branches in the hollow body and give a reliable hold. I have an instrument for narrow hollow bodies that is constructed as fine as a tipped sound. When the tip of the sound is pulled back, the four arms spread out.

II.—FOREIGN BODIES WHICH ARE NOT HARD.

There is an intermediate form, with a consistency of wood and cork. I include nut-shells in this class, altogether 9 cases (Voltilini, Schmidt, Neumeyer, Pieniazek 2, d'Astros, Kausch, Cavaillon, Munasse).

As far as the technic is concerned, upper and lower tracheobronchoscopy may be used to remove the foreign body. Extraction forceps are satisfactory. Those that break easily, such as nut kernels, must be removed with great care. (Cases of Chiari, Hinsberg, Kob, von Eicken, Nishiama.) If they are broken with the forceps, a number of foreign bodies are made out of the one, a danger whose effect will be lessened by the

fact that the smaller portion may be more easily coughed up. Still one must not depend too much on this, as complication may result, especially in small children. Von Eicken's case is noteworthy. In this, a child of 14 months, a high grade of interstitial emphysema developed very rapidly, after he was unable to find the foreign body by upper bronchoscopy. Tracheotomy did not improve the emphysema, and the child died during the night. In order to prevent the breaking of the kernels, it is best to enter carefully with opened bean forceps and to grasp the whole kernel at once, and extract it at once without pressure..

Seeds of Melons, Oranges, Dates, etc.—(Yankauer, Paunz, Panner, Guisez, Saint Germain, Thomas Clayter). Our new sharp hook forceps which I have recommended for pieces of bone is just right for such fruit seeds, for they always clutch the foreign body tight.

There is a case of H. v. Schrötter to be mentioned in which pepper-corns had been inspired. These were very irritating to the bronchial mucosa and called for immediate removal. Schrötter's case, a child 11 months old, died one day later in spite of tracheotomy and lower bronchoscopy. It was impossible to locate the two pepper-corns, one of which was found on autopsy in the bronchus of the right lower lobe and one in the mouth of the bronchus of the right middle lobe.

Many cases are reported involving soft and coherent bodies, such as cotton, pieces of meat, quill of an arrow, down. (E. Mayer, Neumeyer, Hirschland, Bodmer, G. Killian.) There are, however, soft but not coherent objects, as pieces of fruit, pieces of turnip, plant leaves, etc. (G. Killian, Gottstein, Nowotny, Jackson.) These things may be serious for the moment, if they are of large size; otherwise they are coughed up in parts or in toto. The extraction with forceps offers no difficulty for coherent bodies; such as are not coherent must be removed with bean forceps.

Cereal Spikes. (Cases of Pieniazek and Neumeyer.) I have collected twenty-six cases in the pre-bronchoscopic period. A consideration of these cases teaches that cereal spikes are foreign bodies which are of a very individual type. They do not remain in the position in the trachea or bronchus in which they were placed by inspiration, but gradually wander deeper, so that it is always less and less easy to seize them.

They can, on this account, seldom be removed. They cause pulmonary complications and may finally be thrown out peripherally with the pus, if they are not already coughed up whole or in part. One-fourth of the patients died.

The two cases observed under bronchoscopy were not much better on that account. One, a child of eight months, died in spite of the extraction; in the other, the object was not seen and the expulsion was not noted.

We should treat these cases as soon as possible. In making the extraction, it is to be understood that the spikes have their points directed upwards—i. e., against the line of extraction. They can be completely removed only if they are completely surrounded by a properly formed fenestrated forceps.

Expansible Fruit-kernels, Beans, Etc. Bean cases (Pieniazek, 3; G. Killian, 2; Nahrkorn, 2; Kümmel, Harrington, von Eicken, Gottstein, Siebenmann, Kausch, 2; E. Mayer, New York, Nowotny, Pommering, Kahler; eighteen cases in all). In addition, three similar cases (H. von Schrötter, Paunz, Fletcher Ingals). Beans are the most commonly inspired foreign bodies. Over 100 cases were reported in pre-bronchoscopic times. The number under bronchoscopic examinations reaches eighteen cases. We must, therefore, be assured that we shall have much more to do with these serious foreign bodies, involving small children, generally.

Beans are at the beginning movable, but become fixed as soon as they swell, in the opening of the bronchus, much more frequently in the right than in the left. By swelling, they shut off the dependent lung tissue and as a rule the whole lobe. Bronchitic secretion collects below them and pneumonia symptoms with high fever and extensive atalectasis soon develop. Thirty-nine per cent of former cases die.

As these complications occur very soon, indeed, in the course of a few days, we cannot operate too promptly upon such a case. In addition we meet with the very unpleasant changes caused by the swelling, which makes the bean soft and crumbling.

So far there has been little satisfaction with upper bronchoscopy. In only two cases was it in some measure successful, and once suffocation followed because one-half of the bean fell into the sound lung and shut it off. Secondary tracheotomy was required in two other cases.

Apparently the subglottic portion was too severely irritated by the frequent passage of the tube for removal of the fragments.

Lower bronchoscopy, which I must most earnestly recommend, was uniformly successful in thirteen cases—that is, the bean was removed. However, two died suddenly and others suffered for a long time from broncho-pneumonia before they were relieved. I still cling to the hope that we shall secure better results by earlier treatment, improvements in instruments and additional experience.

I have had constructed for the extraction of beans a special forceps which lately has been improved by my assistant, Brünings. It surrounds the bean after the fashion of an obstetric forceps, spreading easily by pushing (in order to dilate the bronchus and damage the swollen bean as little as possible) and closing with delicate pressure. Practice will demonstrate whether this instrument will meet all indications.

RESUME OF THE RESULTS FROM TRACHEO-BRONCHOSCOPY SO FAR ATTAINED.

If we endeavor to give an account of what has been attained by the new method of treatment of foreign bodies, we must consider that the 164 cases, published up to the present time, show many imperfections and comprise a time which can be called the infancy of tracheo-bronchoscopy. In some instances the upper method was not undertaken or failed, nothing could be seen, the extraction could not be carried out, or practice, experience or necessary instruments were wanting—introducing tube, exhaust pump and especially extraction instruments which had not been anticipated. The same things have played a great role in the easier lower bronchoscopy, so that many things in unexpected ways caused the operator to work in the dark after he had seen the foreign body.

In spite of all of this, most remarkable results have been secured. Most of the patients were relieved by one or the other method, and sometimes nature herself assisted by causing the foreign body to be coughed up (eight times). But of 159 cases (leaving out five with unknown result), twenty-one—13 per cent—died, for which the new method is but slightly responsible—two deaths from cocain, two in which it was impossible to remove the object on account of bronchial stenosis and one from suffocation, in spite of upper and lower bronchoscopy. The remaining sixteen died of pulmonary

complications, five with the foreign body in the lung, and the others in spite of removal. Even a casual glance shows that early extraction will reduce the mortality to a minimum.

Upper bronchoscopy has been fully successful in fifty-four cases and lower bronchoscopy in sixty-three.

My own statistics give perhaps a better judgment for the future of cases of foreign bodies in the deeper air passages than the general, since I have gradually acquired a larger experience and practice. Nevertheless, I have the impression that in many cases my technic has not reached the highest mark and I hope to obtain better results in the future. As shown by the list of cases, only one death resulted in the eighteen cases and this was six months after the removal of the foreign body, caused by severe lung complication, due to its long sojourn in the air passages. In only two cases was I unable to find the foreign body and in only one was I unable to remove it on account of its being coughed up.

Upper bronchoscopy was performed in twelve cases, upper and lower in five and lower tracheo-bronchoscopy alone in one. However, I hope in the future, with improved technic, to be successful with the upper method at the first sitting and to use the lower only in the severest cases.

May the future bring this operation into general use.*

MY FOREIGN BODY CASES TREATED BY TRACHEO-BRONCHOSCOPY.

Needles:

Case I. I was called on in 1900 to treat a young man who, ten years before, when a school boy of 14 years, inspired a long needle with a black glass head, while playing with a pea shooter. The immediate symptoms were cough and attacks of dyspnea, which gradually disappeared. Two months before, following bodily exertion, there was a slight pulmonary hemorrhage, which did not recur.

The needle was visible in the Röntgen picture, in spite of its ten years' sojourn in the lungs. I made three upper bronchoscopic examinations of the right lung without finding the foreign body. Then I made lower bronchoscopy twice, after

*Since I wrote this, I have seen the foreign body removed by upper bronchoscopy at the first sitting, twice in my clinic and twice on my American trip. The first was by Dr. Von Eicken, the second by Dr. Brünings, the third and fourth by me in New York and Chicago respectively.

tracheotomy. The main passageway and the orifices of the lateral passages of the right bronchial system were carefully examined without finding the needle or any evidence of its presence. I surmise that it had stuck into the branches of the middle lobe or at least into the tissues in this neighborhood. Patient has remained well.

Case II. A druggist who for fifteen years was addicted to morphin had inspired the needle of a Pravaz syringe. The symptoms, which were mild at first, soon developed into a sticking pain in the chest and irritative cough. On the sixth day, the needle was observed by X-rays in the right lung, where it lay quite deep. Its shadow corresponded to the fourth rib anteriorly and to the seventh or eighth posteriorly. The head of the needle was below. When the patient came to me on the ninth day for examination I found numerous moderate ronchi over the right lower lung, especially on inspiration, but no dullness. Two days later, eleven after the accident, I undertook upper bronchoscopy under general anesthesia, after the patient had received an injection of his maximum morphin dose (0.06 gram.). The needle was discovered 34 cm. from the upper teeth, by means of the tube 35 cm. long and 11 cm. in diameter. I removed the needle, which was inclined from below and outwards to above and within; its point was inserted in the medial bronchial wall and covered with a granulation. The needle lay substantially in the main bronchus of the lower lobe, and its head stuck in one of its branches. I carefully cocainized the neighborhood of the needle. The patient thereupon coughed, forcing the point of the needle free and it could then easily be grasped by von Eicken's forceps. The extraction was rapidly accomplished through the tube. The rales in the right lower lobe disappeared in a short time. Recovery.

Pebbles:

Case III. Boy four years old, August, 1904. An hour before, while playing, he had aspired a foreign body of unknown character. Slight dyspepsia, marked tracheal stridor. Cough, slight and infrequent. Chloroform anesthesia and bronchoscopy with a tube 21x0.7 cm. The foreign body was seen near the bifurcation, sticking partially in the right main bronchus. It was of a flat shape and could be readily extracted with tube forceps. The pebble was 13 mm. long, 8 to 9 mm. broad and 2 to 3 mm. thick.

The child slept a short time, waked up happy and pleasant and went home three hours after the extraction. Five hours had elapsed between the inspiration of the pebble and the return of the patient home. Recovery.

Pieces of Bone:

Case IV. Man, sixty-three years old, on March 27, 1897, while eating soup made of pork, inspired a bone. Cough, dyspnea, slight bloody expectoration. Three days later, direct upper tracheoscopy under cocain with patient in the sitting position. The tube was only 25 cm. long and 9 mm. in diameter. For all that, I was able to see the foreign body in the entrance of the right main bronchus and after some fruitless efforts I succeeded in removing it. The object was 17x14x8 mm. and was composed of spongy bone substance. Cortical bone was found in only one place. Patient left for home next day. Recovery.

Case V. Man, 42 years old, inspired a piece of bone, in March, 1896. Severe lung symptoms, pneumonic and pleuritic processes and bronchiectasis developed, until he was subjected to upper bronchoscopy on Dec. 21, 1899, under cocain and morphin. The bone was seen as a diagonally placed plate 3 cm. deep in the right main bronchus. It was very difficult to engage on account of extraordinarily abundant mucus products, but after some failures it was removed. It was 15x11x4 mm. The symptoms of the patient soon improved and after a year or so he was relatively well.

Case VI. Woman, 33 years of age, with slight tubercular infiltration of the left upper lobe, six months pregnant, inspired a piece of bone, fourteen days before. Since then, cough almost to suffocation. Upper bronchoscopy, under morphin cocain anesthesia, with a tube 35 cm. by 0.9 cm., patient in the sitting position, showed the bone in the entrance of the bronchus of the right upper lobe. Unfortunately, it was pushed with a cocain applicator into the right lower lobe and it stuck there so tightly that it could not be removed by a second upper bronchoscopy. The mucosa was swollen around it and was covered with fibrinous membrane. I performed tracheotomy and, several days later, used lower bronchoscopy with a tube 23 by 0.7 cm., the patient being in the recumbent position. In spite of the abundant mucus and pus, it was possible to pass the Lister hook beyond the bone and to effect its removal through the tube. Its dimensions were 8 by 7 by 5 mm. Im-

mediate removal of the canula. Recovery. The signs over the left apex had practically disappeared six months later.

Case VII. A woman, 20 years of age, came under my treatment, March 14, 1903, on account of a piece of bone which she had inspired in the middle of September, 1902. The sequelae were severe cough, shortness of breath, hemoptysis. On examination, a loud rale was heard posteriorly and inferiorly, strongest over the eighth rib on the right side. Upper bronchoscopy with a tube 24 by 0.9 cm. was performed the next day, with hanging head, under morphin chloroform anesthesia, as the patient was very nervous. The bone was found in the first lateral branch of the bronchus of the right lower lobe. In order to reach it well, it was necessary to introduce a tube 34 by 0.7 cm. through the former. The bone was situated 31 cm. from the upper teeth. The forceps was unable to engage, but the Lister hook was successful. It was supported by the end of the lower tube and the bone was drawn up, together with both tubes. In this way, unfortunately, it was lost, so it was again necessary to introduce the tube and the extraction was accomplished by Lister's hook at the second effort. The bone, which was of cortical and spongy substance, was 13 by 11 by 9 mm. in size. Recovery rapid.

Case VIII. Man, aet. 56. Inspiration of a piece of bone, February 7, 1904. As the patient suffered a great deal, he was put under morphin chloroform narcosis on May 21, 1904. Under upper bronchoscopy with a tube 32 by 1.1 cm., I found the piece of bone in the left main bronchus and, grasping it with the forceps, accomplished its extraction. The foreign body, covered with bad smelling pus, measured 2 by 1 by 0.5 cm. Recovery rapid.

Case IX. Man, aet. 24. Inspiration of piece of bone, Mar. 29, 1906. Mild pulmonary symptoms soon appeared. On May 23, under morphin chloroform narcosis, upper bronchoscopy was performed with a 9 mm. tube. It was impossible with the forceps and hook to grasp the bone, which was found in the right main bronchus, on account of the severe coughing paroxysms of the patient. The bone sank deeper so that it was not possible any more to get beyond it. I, therefore, performed tracheotomy immediately, and after some days, lower bronchoscopy with morphin cocain anesthesia. It was even still more difficult to take out the foreign body, first with fine, sharp hooks and then with the blunt Lister hook. Canula immediately re-

moved; signs of atelectasis of the right lower lobe disappeared after a week. Size of the bone 13x13x7 mm. Recovery.

Shirt and Collar Buttons:

Case X. Man, aet. eighteen, a half year before, inspired a shirt button into the left lung, followed by severe pulmonary symptoms, which developed into extensive bronchiestasis with tremendous pus production. It was unfortunately not possible to find the foreign body, although upper bronchoscopy was twice performed. I was forced, therefore, to perform tracheotomy and lower bronchoscopy on July 20, 1901, under morphin cocain. The extraction was, however, very difficult, inasmuch as the collar button had, through the previous fruitless efforts, been forced deep into the division of the left lower lobe bronchus. Finally, the button was held against the bronchoscopic tube with a Lister's hook and extracted, whereupon the pulmonary symptoms rapidly improved. Six months later, however, the patient was attacked with suppurative pleurisy on the other side, and died.

Case XI. Man, aged 40, inspired a shirt button on Dec. 27, 1902. Two days later, upper bronchoscopy was performed under cocain with the patient in the sitting position. The button was found deep in the left lower lobe bronchus. As it was placed diagonally, it was easily grasped with the hook, h[illegible] against the tube and removed. Recovery.

Case XII. Boy, aged 10, inspired a porcelain collar button on August 20, 1905, followed by severe pulmonary symptoms with high fever. Upper bronchoscopy on the evening of the third day, under chloroform anesthesia, with a tube 9 mm. in diamter, which was introduced through a tube spatula. The button stuck in the left main bronchus with its plate above. No instrument, not even the hook, could pass it, as there was no space between the plate and the bronchial wall. Tracheotomy. Two days later, lower bronchoscopy. Extraction was accomplished with the Lister hook only after numerous fruitless efforts, as the head was so smooth that it always glided off. The lung symptoms disappeared after a few days. Early recovery.

Small Hollow Brass Bodies:

Case XIII. Boy, aged 8, twelve weeks ago (1903) inspired a brass case into the right lung. Upper direct bronchoscopy, with hanging head, under general anesthesia, with a tube 7 mm. in diameter, which was introduced through a tube spatula. The case was engaged in the lower end of the tube and was removed without any other agency. Recovery.

Tin Whistle.

Case XIV. A girl of seven inspired a small tin whistle belonging to a playing instrument, on April 18, 1904. Very severe paroxysms of coughing immediately appeared and an inspiratory stridor was heard. The other usual bad symptoms were absent. The Röntgen picture showed the foreign body at the level of the seventh rib behind on the right side. It was necessary to perform upper bronchoscopy three times under general anesthesia before extraction was satisfactorily accomplished, August 4, 1904. A tube 20 by 0.7 cm. was used, through which a second 5 mm. in diameter was introduced 5 cm. farther down. For extraction I had a special instrument made with four arms, which spread out when the head was pulled back. This was introduced into the hollow portion and thus the extraction was accomplished. Two days later the lungs were entirely free. Recovery.

Down Feathers:

Case XV. Woman, aged 42, who had for twenty years been engaged in picking chicken feathers, had been attacked with diffuse bronchitis for three years. She had occasionally coughed up down feathers. As it was possible that there were other feathers in the lungs, I performed upper bronchosocpy in January, 1902, under cocain, with the patient in the recumbent position. It was not possible, in spite of the most careful search of the bronchial tree, to find a single feather, yet she coughed up such a one a few days later.

Case XVI. A nine year old boy inspired, August, 1898, a piece of pear into the right lung, which could be seen January 3, 1899, by means of upper direct bronchoscopy, under general anesthesia. It lay at the opening of the bronchus of the right middle lobe, and was covered in part with granulations. Inasmuch as a proper extraction instrument was lacking, the removal of the foreign body was postponed. Four days later, bronchoscopic examination showed that it was not present, since it had been coughed up in the meantime. Recovery.

Beans:

Case XVII. Boy, four years old, had inspired a large bean on the morning of September 27, 1898. At the beginning there were slight disturbances. In the evening, however, dyspnea and cyanosis appeared. The right half of the thorax was fixed on breathing. On the following day I performed tracheotomy on account of the dyspnea, whereupon the bean, which was still movable, appeared, but was immediately inspired into

the depths and could be removed only with a sharp hook under lower bronchoscopy. In the beginning, it had obstructed the right main bronchus. It was 10 by 18 mm. in size. The child recovered in a few days, after slight bronchitis.

Case XVIII. Boy, aged 6, inspired a bean on Oct. 31, 1900. On the evening of November 3 the right lower lobe was markedly dull, and the temperature 39.1 C (102.4 F.). Upper bronchoscopy, under general anesthesia, showed a swollen bean in the right main bronchus. It was impossible to engage it with the sharp hook. It was possible to reach it with the dull hook and to draw it into the trachea. A quantity of purulent mucus came out of the right bronchial tree. A piece of the bean cortex was coughed out; the remainder lay movable in the trachea, striking the cords violently on expiration. When I reintroduced the tube rapidly, the breathing was disturbed, as the bean was pressed against the tube on expiration. I pushed it back with forceps and engaged it, which caused it to break into pieces. Another piece of the cortex, and some of the smaller fragments, were coughed up; others I removed with forceps and hook through several introductions. One-fourth of the bean was still lacking, which must have been coughed up, as the most persistent search of the right and left bronchial system failed to reveal it. The temperature rapidly sank, the child improved, and ten days later had recovered from his bronchitis, and was discharged.

ESOPHAGUS.

My clinic provides, in the course of the year, a rich material in foreign bodies in the esophagus.

We performed esophagoscopy in all cases where the patient thought he had swallowed a foreign body, and we consider this method most satisfactory from a diagnostic and therapeutic standpoint.

The character of the foreign bodies which occur in the esophagus is not so varied as in the respiratory tract. They are mainly pieces of bone, meat fragments, artificial dentures, or parts of the same, and coins, especially in children. Needles, fishbones, and fruit seeds (plum), are occasionally seen. All other things are uncommon. Pieces of bone, meat fragments and dentures may be quite large. Small pieces of bone and food come into play, especially when there is stenosis of the esophagus. They may be impacted above or within it.

All foreign bodies in the normal esophagus are caught in the neighborhood of the cricoid, at the beginning of the esophagus, which is kept closed by muscular action and is opened only on deglutition. Everything that is not soft, smooth, and readily passable, and exceeds a definite volume, is lightly held in this place. In all cases in which a bougie has not been used on the patient, we may be certain that the foreign body is at the beginning of the esophagus near the lower portion of the larynx. Needles, fishbones, and nails usually stick in this place and glide down slowly with the food into the deeper portions. As a stenosis may easily result on account of the impaction of the foreign body in the entrance of the esophagus, the saliva itself is difficult to swallow. This makes the examination of the sitting patient very unpleasant and uncomfortable for physician and patient, on account of the excessive salivation. I prefer, therefore, to have such patients lying down on the right side, or left side, whether under general anesthesia or not. The operating table must be so arranged that the shoulder and head lie somewhat lower, so that the saliva, which is collected, runs out of the corner of the mouth.

Cocainization is employed while the patient is in the sitting position, and general anesthesia is used only in children. Care must be taken not to push the foreign body deeper during cocainization. It passes easily into the stomach, and we may search in vain for it. This is no great pity, as experience shows that, with favorable diet, the foreign body passes off in the usual way.

Sharp bodies, needles and nails, however, may occasionally cause annoyance. One of my patients could very easily feel the pin in his stomach, and in the evening in the cecal region. Another patient had very severe pains in the abdomen, as long as the needle journeyed through the intestines. Once we feared complications; however, everything went well.

When the foreign body slips into the stomach, the patient has the distressing feeling, until it passes away, that it may still cause unpleasant symptoms. It is, therefore, desirable for him, and for the esophagoscopist as well, that the corpus delicti be removed and exhibited.

Esophagoscopy is performed with a tube spatula which is introduced without insertion of the finger, under good light from a hand mirror or forehead lamp. The patient holds his

tongue, in the beginning. The collected secretion is removed with the exhaust pump. We approach the foreign body slowly with the tube spatula and locate carefully for the purpose of extraction.

Coins, pieces of bone, artificial dentures are situated in a flat position in the esophagus, in a frontal direction. We introduce a properly formed clutch forceps or bean forceps with branches in front and behind the foreign body, and then it may be easily removed. The highest portion should be engaged, so that it may not attach itself to anything and make it difficult to remove. When a sharp point has been caught, it must be pushed backward. Most of the bodies are too large to pass through the tube, and so are removed with it. There is an advantage, in that the tube dilates the way for the foreign body.

The resistance to be overcome in extraction is stronger when the mucous membrane over the foreign body is swollen by inflammation. No force should be used in overcoming this resistance. Impacted bodies may often be drawn some distance upwards, since the esophagus may be stretched. There comes a time, therefore, when the resistance is so increased that there is danger of tearing the esophagus. This condition is recognized when the released foreign body flies back immediately into its old location.

Coins are most certain of extraction, since they are smooth and are unable to wound anything. They can be drawn out with force, without the likelihood of doing harm. Coins should not be removed except by means of the esophagoscope. I do not consider that esophagotomy in this respect is a modern procedure any more. We must energetically defend this proposition. Not less should we oppose the use of coin removers. These cases are always in children, and it is just in such that the coin removers usually purchased may do harm. I once saw a case in which a colleague had slit almost the whole esophagus with a coin remover, after which he was unable to remove the instrument. After it was removed at the surgical clinic, I observed the wound by means of the esophagoscope. Of course the child soon died from suppurative mediastinitis.

Fruit seeds are to be treated like coins. Fishbones or needles may be grasped with von Eicken's forceps in the neighborhood of the point and removed.

Remains of food and pieces of meat slip very easily into the stomach if some space is made by cocainization or by pressure with the tube. If they remain, they must have a very considerable caliber. Then the extraction may be difficult and of long duration. The forceps tears away the portion grasped, and so only a piece is removed. On this account, it is necessary often to re-enter, unless a very broad portion is seized. On the other hand, if a broad portion of the piece of meat is grasped, it may happen that on account of its size it finds so great resistance behind the larynx that it is impossible for it to pass, as happened in one of my cases. Only after I had gradually reduced it in size was the extraction successful.

Pieces of bone are not always of satisfactory form. Old persons who have impaired sensations of taste in the mouth, on account of a defective set of teeth, may swallow large bones unconsciously, without having a clear understanding of their size or form. It thus happens that there are really serious bones with sharp lateral processes which cannot be seen by esophagoscopy. These may become impacted upon extraction. If these do not glide readily, great care must be taken in extraction and success accomplished by pushing backward, moving to and fro, and grasping in different places. If not successful without force, esophagotomy is far better for the patient.

What has been said is true of artificial dentures. Here at least we have the advantage of knowing, from the patient, the size and shape of the foreign body swallowed. On this account, we are able to look out for projections and hooks. Besides, we will know whether or not the plate is made out of rubber or metal. In spite of all difficulties, many artificial plates have been successfully removed. I warn, however, the very energetic, against the exhibition of force. If there is a wound of the esophagus, severe symptoms will rapidly occur, which can be met only with early mediastinotomy or the patient is surely certain of death. If the extraction, by the natural way, appears risky, then esophagotomy is to be preferred. It is only when the artificial plate is not made out of metal and contains no metal that it will be possible to cut it up into pieces by the galvano-cautery snare, which was satisfactory in one of my cases. The snare is made narrow, and is pushed far beyond the plate. The wire is then pushed to one side (since the snare is unfolded better in this way).

There is now a large snare wire beyond the plate which catches it when drawn upward; it can be easily cut by a very small amount of heat. Perhaps there will be constructed harmless instruments which may cut metallic artificial plates within the esophagus.

I have been assuming, up to this time, that the foreign body is in the upper portion of the esophagus. It may, however, as has already been stated, be pushed deeper and deeper by the tube spatula and during the efforts at extraction, even as far as the cardia. The practitioners into whose hands the case first comes are often responsible for pushing it down. If otherwise there is no success, they exert themselves to push the foreign body into the stomach. We then usually find severer symptoms.

A simple tube spatula is no longer sufficient, so it must be lengthened by the introduction of tubes which will pass directly to the foreign body.

Naturally, the different depths required an extracting instrument which corresponds in length. The distance to the cardia in tall men is 50 cm. from the upper teeth. Accordingly, we must be prepared for this condition. The extraction is made more difficult on account of working in the deeper portions, but it is not so much as the uninitiated think. One may soon learn to throw a good light through the long tube sufficient to see and to carry on the technic of extraction. Even complicated treatment may be undertaken in the neighborhood of the cardia, as shown by the case reported of cutting up of artificial plate within the esophagus.

It is much more serious when a larger foreign body, which cannot be cut up, is impacted in the deeper portions. In such cases gastrotomy must be performed and the foreign body removed from below. Posterior mediastinotomy was in one case successful, but, unfortunately, this operation is still so dangerous that it is almost always followed by death.

If the foreign body lies above or within a stenosis, the same rules apply for examination and extraction. One will hardly meet with greater difficulties; under certain circumstances the patient may be saved from a gastrostomy already planned.

There are cases also in which esophagoscopy is contraindicated from the beginning. It is best to refrain entirely if the symptoms indicate that there is a perforation of the wall of the esophagus: i. e., intense pain in the neighborhood of the

perforation, increased temperature, emphysema of the skin. We should look out for such symptoms, especially if some one else has dealt with the patient. The esophagus may cut itself on the sharp surface if a strong effort at swallowing is made.

A perforation necessitates an external operation. The tissues in the neighborhood are very rapidly infected and must be very widely opened and the point of perforation found. It is therefore best to leave the foreign body alone and to make an esophagotomy; in this way the position of the perforation will be more easily found. As to the question whether to open on the right or the left side, the greater pain decides. The chances for cure are better in the high perforation. We were successful in two patients. A patient with deep perforation died in spite of mediastinotomy from the neck. Here deep posterior mediastinotomy bespeaks better results.

I must still mention that, instead of a foreign body, there may be only scratches, especially in the neighborhood of the pharynx and entrance of the esophagus, which make the patient believe that the foreign body still sticks there unless we demonstrate the opposite by esophagoscopic examination. I do not believe that a foreign body in the esophagus can be overlooked under proper technic.

If I exclude the two cases in which the patients already had severe wounds of the esophagus, I have no deaths to report; all were promptly cured. This is certainly a good result in 17 cases.

FOREIGN BODIES IN THE ESOPHAGUS: CASES FROM THE CLINIC TREATED BY G. KILLIAN AND C. VON EIKEN.

Case I. Man, aged 62. September 24, 1898. Two hours before, he swallowed a bone, since which time he has had severe pains in the neighborhood of the cricoid cartilage. Difficulty in swallowing. Esophagoscopy. By pushing the tube behind the cricoid, the piece of bone was observed for a moment; it was freed from its lodgment and, with lightning rapidity, disappeared in the depths. After several days it passed off in the natural way. It was of spongy material, 1 cm. long by 0 75 cm. wide.

Case II. Woman, aged 26 years, March 7, 1903. Yesterday evening, patient swallowed a small chicken bone. Severe

pain below the larynx. With the laryngoscope, a blood blister was seen deep in the left sinus pyriformis. Esophagoscopy with a tube spatula 14 by 1.3 cm. A small and pointed bone was found in the upper portion of the esophagus impacted in the mucosa; it was grasped with a forceps, loosened and removed; 12 by 2 mm. in size. Recovery.

Case III. Woman, aged 79. May 19, 1902. Patient swallowed a bone while eating soup two days ago. The physician made fruitless efforts to remove the foreign body. Severe pains appeared the following night, which kept the patient from swallowing anything. An examination for extraction was made on the third day after; we found hemorrhage on both sides of the palate and in the left sinus pyriformis. The left ventricular band and vocal band were decidedly reddened. Esophagoscopy. At first a short tube was used and then a tube 39 cm. long by 9 mm. in diameter. Just above the cardia a large piece of bone projected with a sharp edge upward. Extraction with the tube. Recovery.

Case IV. Man, aged 59 years, on December 29, 1901, swallowed, with his soup, a piece of bone which remained in the neighborhood of the cricoid. Patient ate bread afterwards and thereby the bone passed down somewhat deeper. A physician sought to push the foreign body into the depths with a sponge probang, but was successful only for a short distance. Attempts with other instruments were without success, and the instruments were covered with blood when they were removed from the esophagus. Patient had no more pain afterwards. At about nine o'clock of the evening of the same day, under esophagoscopy, with a tube 14 mm. in diameter by 25 cm., measured from the upper teeth, the esophagus was found filled with blood clots, among which shreds of tissue were visible. After thoroughly cleaning the field of view with the exhaust pump, a very severe wound of the esophagus was observed. At the same time a brownish red body presented itself, which was found, on extraction, to be a piece of meat. Another introduction of the tube led to the finding of the bone. Its point was grasped by the forceps. There was enormous resistance upon drawing it, whereupon the foreign body was pushed some distance deeper by the tube and then removed. An unusually large, flat bone came to view, 3.6 by 2.8 cm. large, which on one side presented long prongs which were arranged opposite the apex of the bone and which acted

as barbs. At the beginning, the patient's symptoms were moderate, the pain lessened, but later there was additional pain on the right side. Morphin injection. Temperature the next morning 38.4 C. (101.1 F.). External mediastinotomy was performed in the surgical clinic by Kraske. The esophagus was stretched and infiltrated, and was followed 10 cm. into the chest. Wide opening of the tissues, but perforation not found. Increased symptoms and fever. Death in one week. Autopsy showed a large tear which began 10 cm. below the cricoid and was 5 cm. long. This led into a putrid abscess in the right mediastinum, opposite of the hilus of the right lung. We had been unable to find the tear, because we were operating on the wrong side. This would have been prevented if an esophagoscopic examination had followed the extraction. This was attempted but the electric light failed.

Case V. Man, aged 20, swallowed a bone of a hog on August 12, 1905, which was pushed down by the physician in attendance. Pain was experienced 35 cm. from the upper teeth. Fluids only could be swallowed. Esophagoscopy was performed two days later with the patient lying on the left side, the tube being 42 by 1.4 cm. The bone appeared at a distance of 36 cm. in a diagonal position. It could be easily grasped but it slipped away at 20 cm. and was again grasped, after which the extraction was successful. Secondary examination showed a small wound of the mucosa where the foreign body lay. Recovery.

Case VI. Man, aged 21, had swallowed, on that morning, a piece of chicken bone which stuck 22 cm. under the cricoid. Esophagoscopy, with a tube 30 by 0.7 cm., revealed the bone, surrounded by remains of food. Fruitless efforts with the bean forceps were followed by success with the toothed forceps. Length of bone, 3 cm. Course good.

Case VII. Woman, aged 69, had, since day before yesterday, that is November 13, 1906, a bone in her esophagus. Pain behind the cricoid. The attending physician made four attempts to push it down. Severe pain followed in the lowest dorsal vertebra. Temperature 37.5 C. (99.5 F.) Laryngoscopy showed mucous membrane in left sinus pyriformis swollen. The bougie discovered a resistance at 38 cm. Esophagoscopy, in the right lateral position, with a tube 42 by 1.1 cm. At a depth of 36 cm., a sharp horizontally placed piece of bone was observed. This was grasped with the forceps, but

was caught in the mucous membrane with its upper end, upon being drawn out, so that it became necessary to release it. Upon new efforts being made with the tube, it suddenly disappeared into the stomach. Course good.

Case VIII. Man, aged 43, while eating noodle soup, swallowed, at 11 o'clock today, a bone which remained sticking in his throat. The patient ate a great deal of meat afterwards, in order to force the bone down, but the attempt was not successful. Severe pains in the jugulum. Esophagoscopy with tube spatula three hours later. Only after removal of some pieces of meat could the bone be seen and extracted with the toothed forceps, after overcoming a certain resistance. It was as thick as a small thumb with an apex upward and a broad portion downward. Some scratches were discovered by subsequent examination. Patient soon left for home. Recovery.

Case IX. A boy, aged 1½, swallowed a coin on January 13, 1903. Several hours later this was found by means of Röntgen rays, sticking under the cricoid where it could be felt with the finger. Slight general anesthesia. Tube spatula. Extraction with forceps. The coin was a ten pfennig piece.

Case X. Girl, aged 9, in August, 1904, two days before swallowed a coin, which was visible with the Röntgen rays under the cricoid. Esophagoscopy, patient on the left side. A tube 18 by 0.7 cm. was introduced with a guide tube. The edge of the coin came into view under an inflamed swollen portion of the mucous membrane. The inflammatory swelling caused a distinct resistance to extraction. Recovery. The coin was a two kreutzer piece of 1815.

Case XI. Girl, aged 10, had swallowed a two pfennig piece two hours before (August 10, 1906). Difficulty of swallowing. Coin visible in Röntgen picture under the cricoid in a frontal position. Esophagoscopy in sitting position under cocain, with a tube spatula, 12 by 0.7 cm. The coin could be seen but could not be grasped on account of the great salivation. Thereupon esophagoscopy was performed in the lateral position with a longer tube. Saliva was drawn off with the exhaust pump. The coin in the meantime slipped into the stomach and passed off in a few days with the feces. Recovery.

Case XII. Child of 2½ years had swallowed a five pfennig piece twelve days before October 10, 1906. Transitory fever.

Swallowing of food difficult, milk only being possible. The child had suffered for some time from an extensive infantile paralysis. The coin was visible in the Röntgen picture in the upper portion of the esophagus. Esophagoscopy, under general anesthesia, on the right side. Introduction of a tube, 5 mm. in diameter, could only be accomplished by bending the head as far back as possible. A resistance was encountered in the upper portion of the esophagus, which appeared as a circular stenosis with whitish deposit on the mucous membrane. After cleaning the field with the exhaust pump, the upper portion of the coin was visible. The esophagus opened up at each inspiration, so that it was easy to grasp the coin at that moment. There was some resistance in the neighborhood of the stenosis. Recovery from the effects of the foreign body.

Case XIII. Man, aged 67, had swallowed, on the evening of the day when he came to me, December 29, 1906, a large piece of solid meat of a hog's heart, without much chewing. Patient was in a hurry; he had no teeth. The piece of meat remained sticking in the esophagus. Upon breathing, rales were heard which could be clearly established by the mirror, as caused by the collection of saliva over the larynx. He could not swallow the saliva, as the esophagus was completely obstructed. He could clearly feel that the piece of meat lay high up at the orifice of the esophagus. Esophagoscopy in the left lateral position, under cocain. The mass was grasped by aid of the tube spatula, but upon extraction only a piece was torn off. This was repeated several times. As a result, the piece of meat descended, so that a longer tube was required. The extraction was again not completely successful, only the portion grasped being removed. It was then possible to draw the mass again as far as the cricoid. After a short pause, the tube spatula was again introduced. The mass again descended, so that it could now be reached only with a 40 cm. tube; still I was again able to raise it after removal of a piece, but it once more slipped down. In the endeavor to grasp it in this place, a small piece of the mucosa was caught, causing it to bleed. I made an attempt to push the mass into the stomach, but was unsuccessful as it was too large. There was nothing left except again to perform esophagoscopy, with a tube 50 cm. long, using one of my longest toothed forceps, about 60 cm. long. I soon grasped the mass

of meat and drew it up behind the cricoid where I could bring the tube spatula into action. The forceps tore off a large piece. The mass descended slightly, so that a longer tube was again necessary. It had become so much smaller in volume that it could finally pass by the cricoid. The whole procedure lasted about an hour and a half. In spite of it all, the patient was comparatively little affected. I would not permit him to eat until the second day following, on account of the wounding of the mucous membrane; he was only given some alcohol from time to time. He had some little pain in the throat and slight elevation of temperature. However, the symptoms disappeared by the third day and the patient could soon be discharged as cured.

Case XIV. Woman, aged thirty-seven, on March 3, 1907, while eating soup, swallowed a small plate with two teeth, and came immediately to the clinic. The plate could be felt externally under the cricoid, and it was shown in this place by the Röntgen picture. Esophagoscopy with tube spatula 20 by 1.2 cm. The plate came immediately into view at the opening of the esophagus and was easily removed. Recovery.

Case XV. A woman, aged 32, had swallowed a tooth plate. The Röntgen rays examination gave no result, but with the probe a foreign body could be felt in the esophagus. Attempts to remove or dislodge it were unsuccessful. I saw the woman for the first time eight weeks after the accident. She had, in the meantime, lost strength considerably, not being able to take sufficient nourishment. An examination with the esophagoscope was made and I found the foreign body impacted in the esophagus at a distance of 35 cm. from the upper incisors, therefore near the cardia. I attempted to extract the plate by means of a tubular forceps, but as the resistance offered was so great that I was afraid of injuring the esophagus wall, I had to give up further attempts in this direction. I now began to consider the possibility of diminishing the size of the foreign body and of removing it piecemeal. At first I was able to burn off only a small part, but at a third attempt I succeeded in cutting the plate into two parts by means of a galvanic snare. I introduced this snare with a small loop only, at the side of the plate; then I gradually enlarged the loop by pushing the wire forward on one side only, and then drawing it back. I caught the foreign body, and was able to cut it through with incandescent wire. The

two pieces were easily removed with forceps. I take pleasure in showing them to you here. The patient recovered without interruption. (*British Med. Journal*, August 30, 1902.)

It should be reported that we have, during the past years, examined 17 cases by means of esophagoscopy, in which the foreign body was not present at the time of the examination; scratches only could be found in a portion of the cases. All remained without any bad results. In some, the foreign body soon passed away; in others, it is doubtful if there had been one present. In the last case of this sort, I found a small beginning carcinoma instead of a foreign body. The two following cases may be of interest, although esophagoscopy was not undertaken; it was contraindicated.

Case XVI. A young man came, in the summer of 1904, to our clinic early in the morning, after he had swallowed a fragment of glass on the evening before. It was very hot, and he was very thirsty; he had, with avidity, taken a glass of beer. Although he had broken the glass on the edge of the table, he nevertheless drank it very rapidly, as a result of which a piece of glass stuck in his throat. This could be seen by the Röntgen picture behind the larynx, five or six hours later, when the patient came under our observation. He was suffering greatly and had continual paroxysms of swallowing accompanied by severe pain in the throat. The temperature was 37.8 C. (100 F.). Examining his neck, I found an emphysema of the skin, establishing the existence of a perforation of the esophagus. Evidently the sharp edge of the glass had cut the mucosa and the constrictor. Bloody mucus was seen behind the larynx by means of the laryngoscope. Immediate esophagotomy was indicated in this case. This was performed in our surgical clinic by Dr. Pertz, on the left side, where the pain was greatest. The perforation was found here on the lateral wall of the hypopharynx; after dilatation, it was easy to remove the foreign body. Patient recovered after suffering for some time from esophageal stricture.

Case XVII. A soldier, aged 30, came to the surgical clinic on Aug. 13, 1906, and stated that he had swallowed an artificial denture on the evening before, which consisted of an incisor tooth with a small rubber plate. Efforts at extraction with forceps were made by the attending physician. The patient had pain on swallowing, slight elevation of temperature. I found definite evidence of emphysema of the skin on the

right side of the neck from the face to the third rib, showing that there had been a perforation of the esophagus. For this reason, I refrained from performing esophagoscopy and recommended that esophagotomy be performed in the surgical clinic. As the symptoms indicated it, Kraske opened the neck on the right side and found a perforation in the lateral wall of the hypopharynx. The artificial denture could no longer be found in the esophagus. The bougie entered the stomach without obstruction. Three days later the plate passed off with the feces. Patient recovered after having a temperature for two days of 38.8 C. and 38.5 C. (101.8 and 101.3 F.).

XXI.

MODERN PROCEDURES IN EXCISION OF INTRINSIC MALIGNANT GROWTHS OF THE LARYNX.*

By Dr. J. Solis-Cohen,

Philadelphia, Pa.

Modern procedures exclude all attempts at intralaryngeal extirpation of intrinsic malignant growths of the larynx as virtually futile, except under fortuitous conditions not to be expected. Hence, direct access from the exterior is to be practised in consonance with general surgical principles.

This procedure comprises a central division of the thyroid cartilage, and sometimes of the cricothyroid membrane, cricoid cartilage or even of the trachea, as may be requisite to fully expose the morbid mass and its immediate surroundings when the wings of the thyroid cartilage are separated with retractors or with stout loop ligatures.

This may be done under either local or general anesthesia, and with or without precedent tracheotomy; the choice being dependent in great measure on the location and apparent extent of the neoplasm, and in part on the predilections of the operator.

For many years the writer's preference was for prophylactic tracheotomy several days in advance of the main operation, in order that the patient might become accustomed to the presence of a canula, the retention of which might be requisite for an indefinite period. This opinion, however, has been proven erroneous. Prophylactic tracheotomy is not requisite except where strong indication exists for the precautional use of a tube after operation.

The operative and postoperative technic has become so simplified of late, that the tracheotomy safety tube may be permanently withdrawn in most instances when the operation has been completed. Nevertheless, a properly prepared canula should be at hand for prompt introduction should contingencies arise requiring it. In such instances as seem to demand

*Read at the Twenty-ninth Annual Congress of the American Laryngological Association, May 8, 1907.

retention of canula, a fresh one should replace the tube used during the operation.

Forty years ago the writer reported[1] the extirpation, under ether, of a fibroid growth from the interior of the larynx after access by thyrotomy, without any tracheotomy whatever. On the seventh day the patient, a journeyman shoemaker was working at his last, having been able to sit up within less than twenty-four hours after the operation, and to take a walk in the street upon the fourth day. In this case, as in most of the few other cases upon which the writer has operated, the growth was removed with forceps and scissors; and no stitch whatever was taken in the thyroid cartilage or in its perichondrium.

The immediate technic of operating most in vogue at present is to begin, under chloroform inhalatory anesthesia, with an incision through the skin from the hyoid bone to some distance down upon the trachea. Then a tracheotomy is performed and a tampon canula inserted. The thyroid cartilage is then thoroughly exposed and divided in the median line with bistoury, saw, scissors, or cutting pliers. The wings of the thyroid are separated with retractors or with strong ligatures; cocain solution is applied to the interior of the larynx to control reflex movements, which otherwise are often very embarrassing during the dissection; adrenalin solution is subsequently applied to contract the bloodvessels and lessen the immediate hemorrhage of the excision, while at the same time it facilitates definition of the growth. Under careful retraction of the sides of the larynx, with the best available illumination, whether natural or artificial, the entire diseased tissues are exposed to vision, and removed with a surrounding zone of healthy tissues sufficient to secure the patient immunity from immediate recurrence *in situ*.

The writer continues to prefer his own method, which is to begin with an ordinary tracheotomy in the first place, and, after introduction of the canula, to incise the skin only so far as to uncover the larynx, thus leaving intact a broad bridge of skin above the canula. This lessens, considerably, the dimension of the external wound and favors reunion in the sequence. Should due exposure of the morbid parts require it, this bridge can be cut into, or be sacrificed entirely, but in the majority of cases under consideration it can be spared.

1. N. Y. Medical Record, 1867, p. 218.

Tracheotomy having been performed, a tampon canula is to be introduced to occlude the upper portion of the trachea; preferably Hahn's sponge-covered canula kept in an aseptic solution during the early steps of the operation so as to saturate the sponge. According to conditions, some little time, usually ten to twelve minutes, will have to elapse before the sponge becomes swollen sufficiently to fulfill its purpose and secure the trachea against the entrance of blood. This time is utilized in exposing the thyroid cartilage and getting it ready for division.

Hemorrhage having been controlled, the thyroid cartilage is divided in the middle line with strong, obliquely bent, short, cutting pliers, the lower blade being first thrust through the cricothyroid membrane and passed up to the incisure. In young people a stout bistoury will suffice. The wings of the cartilage are then held asunder with retractors, firmly, but gently, and if the exposure be insufficient for careful manipulation, the cricothyroid ligament and, if necessary, the cricoid cartilage may be divided to afford the required access to the parts. These parts being duly exposed, the interior surface of the larynx is freely mopped with a solution of cocain until the reflex movements are under control, and then the morbid mass, and half an inch or more of surface around it, should be mopped with a solution of adrenalin to diminish hemorrhage and define the growth. When saliva and mucus flow too rapidly into the larynx for control with mopping by an assistant, a tampon, secured to a ligature for easy withdrawal can be pressed into the lower part of the pharynx so as to occlude it and absorb the secretions. In the few instances operated upon by myself this tamponing has not been necessary.

Bleeding and secretions being under control, the excision can be begun. The usual method is to surround the parts to be removed with an elliptic or oval incision down to the perichondrium, and so excise the mass with scissors or bistoury as to remove it, together with the underlying mucous membrane, and then carefully scrape the perichondrium and apply an escharotic. My own preference is, when practicable, to strip the inner perichondrium from the wing of the thyroid cartilage under the entire surface of the parts to be removed, raise the mass intact and sever it with serrated scissors at a distance, as far as may be, of about half an inch from the growth which is left untouched by any instrument, so that it

is removed in one piece looking like a miniature mass of flesh upon a fleshy plate. If the growth be located in the anterior or central portions of the half of the larynx, the denudation of the internal perichondrium can be begun from in front with an elevator or a dull pointed dry dissector such as Allis's, and then working it underneath until the whole of the portion to be severed has been raised from the cartilage. In cases where the growth is too far removed from the line of the thyrotomy incision, the elliptic incision to surround the growth may be made so as to extend through the perichondrium, and the perichondrium can then be attacked at the most accessible point, first with a sharp elevator and then with the blunt dissector.

After the removal of the morbid mass and the drying of the parts, the raw surface is thoroughly mopped with compound tincture of benzoin, and the wings of the thyroid are allowed to reapproximate. The tampon canula is now withdrawn from the trachea, and if breathing be comfortable no attempt is made to introduce another canula unless contingencies arise for it in the after treatment.

Should the adjustment of the wings of the thyroid cartilage be accurate there will be no necessity for taking stitches in the cartilage or in the external perichondrium to keep them in place. The natural resiliency will suffice, for cough occasions less disturbance than is theoretically surmised. Should the wings of the cartilage override, however, it will be necessary to insert sutures to keep them in correct apposition.

In my own practice no stitches are taken in the skin wound. Instead, a longitudinal strip of perforated plaster is placed along each side of the neck an inch or so from the line of incision, and then this plaster is sutured in several places through the perforations, along the line of thyrotomic incision, and tied only so tightly as to bring the severed edges of skin into gentle apposition, and leave the wound free for easy and immediate inspection. No threads are passed over the line of the tracheal incision, which is left bare to favor expulsion of matters from the air passages. A pad of gauze moistened in bichlorid or other antiseptic solution is then placed upon the wounds, while a strip of aseptic gauze is doubled over a strip of adhesive plaster and secured to the neck, so that the gauze hangs down over the dressing upon the seat of the wound. In this manner, there is no strain upon the skin from stretching of sutures, and the parts are readily accessible to inspection and manipulation.

The bed of the patient should have the foot portion raised so as to insure the flow of secretions toward the mouth and away from the air passages, and be so maintained as long as necessary. The patient should be placed near the edge of the bed lying upon the side of operation, and without a pillow under the head. When thirsty, an attempt may be made to draw sterilized water up into the mouth from a bent tube inserted at its lower edge. This will sometimes be practicable within a few hours, and then suitable nourishment can be administered in the same way until cicatrizations are sufficiently advanced to allow the use of more solid food. Should this plan be impracticable, nourishment should be administered by the bowel for a short time, or until deglutition becomes safe.

The post-operative treatment is as important as the operative procedure, and, therefore, the operator or a sufficiently skilled assistant should be within immediate call at least during the first twenty-four hours to combat any adverse conditions which may arise, although it will often be the case that nothing untoward does occur. But when anything untoward does occur, the presence of some one able to meet the emergency may be a matter of vital importance. Should it become necessary for any reason to re-introduce a canula into the trachea, which has to be maintained for several hours or longer, some method for moistening the atmosphere near the head of the bed should be provided so as to prevent the secretions from dessicating, and a piece of moistened gauze can be kept over the orifice of the canula. The external parts are treated on general surgical, antiseptic principles, and, although cicatrization by granulation is to be more or less expected, a large portion of the external wounds often heals by first intention, thanks to the absence of constricting strictures even in the upper portion of the cutaneous incision, and to the bridge of tissue preserved between the incisions for tracheotomy and for thyrotomy.

Under favorable conditions the patient should be able to sit up in three or four days, and should have practically recovered from the operative procedures in from two to six weeks.

In the description of this method it will be observed that much has been learned from the experience of Dr. Butlin and Sir Felix Semon, as reported during recent years; especially the preference of preliminary to prophylactic tracheot-

omy, the use of the loop of ligature in spreading aside the wings of the thyroid when the retractors are insufficient; and the removal of the tracheotomy canula immediately after the extirpation of the growth and attention to the wound of excision.

The retention of the skin bridge between the incisions for tracheotomy and for thyrotomy, the removal of the growth in mass upon a plate of excised perichondrium and superjacent tissue, the dressing with compound tincture of benzoin, and the avoidance of sutures in the cartilage and in the skin, and the special method of loosely approximating the edges of the incisions together are the chief points of variance from the usual methods in the practice of the writer.

XXII.

MYXOFIBROMA OF THE NASOPHARYNX, CAUSING DISFIGUREMENT—REPORT OF A CASE AND EXHIBITION OF SPECIMEN.*

By D. Braden Kyle, A. M., M. D.,

Philadelphia.

The etiology of fibromyxoma of the nasopharynx is still somewhat speculative, but the pathology and site are well known. Simple fibromyxoma may spring from, and be located purely in, the nasopharyngeal space. Its common site of origin is from the basilar process of the occipital bone, a location from which it slowly, but surely, spreads. There seems to be no law controlling the rate or direction of its growth. It may extend upward, producing displacement of bony structure to such an extent as to demand prompt and thorough surgical interference. On extending downward it may fill the nasopharyngeal space and even involve the pharynx.

The symptoms will be determined by the extent of the growth and the line of involvement. If the tendency is downward, there will be early impairment of the voice resonance, the sensation as of the presence of a body in the pharynx, causing continuous swallowing, sensitiveness of the surrounding parts, a slight tendency to hemorrhage, and the individual will have a gaping appearance, owing to the necessitated mouth-breathing. When the tumor extends downward, there will be interference with the normal faucial movements, owing to the obstruction and some partial paralysis from the pressure; there will also be no loss of motion of the soft palate and uvula. If the growth extends upward and reaches sufficient size, the disfigurement of the adjacent structures may take place. There is usually persistent headache and a great feeling of pressure over the bridge of the nose.

The morbid histology of the tumor in this location differs from that found in the nasal cavity only in the fact that there

*Read before the American Laryngological Association, Twenty-ninth Annual Congress, Washington, D. C., May 9, 1907.

are more bundles of fibres and fewer individual stellate cells. This is probably due to the fact that in the nasopharynx and fauces there is more connective tissue present.

The common symptoms of a nasopharyngeal growth of this size are inability to breath through the nose, fullness in the head, with the characteristic nasal twang, difficulty in swallowing, choking sensations, deafness and tinnitus.

The particular case which I wish to report and from which the specimen (see cut) was removed, was a young man, aged 24 years, who presented himself at the Out-Patient Department

Myxofibroma of the Nasopharynx. (Full size)

of the Jefferson Medical College Hospital, complaining of inability to breathe through his nose and also of almost continuous pain or aching in the region of the frontal sinus or over the bridge of nose. On the right side the tumor mass had extended so far forward as to almost protrude from the nostril. By the aid of the rhinoscope the mass in the nasopharynx could be distinctly outlined, although it did not extend below the margin of the soft palate. There was considerable

catarrhal discharge, but no associated symptoms evidencing any involvement of the accessory cavities or the ear. In other words, the symptoms were all directed toward the point of pressure, the bridge of the nose at the inner corner of the right eye, where the distinct swelling stood out prominently. The right nostril was entirely occluded by the tumor mass, while the left nostril was occluded owing to the septum having been deflected by the tumor.

After the removal of the tumor the external displacement and swelling entirely disappeared. I have seen a number of cases of myxofibroma, but this one, to me, was rather unique, and I thought it worth reporting to you.

My object in reporting this case is to call attention to a number of interesting points. First, the site of origin of these pedunculated masses was at the posterior end and underneath the superior turbinated body. Second, as a rule, the tumor extends downward into the nasopharynx, and in a number of cases which I have seen and operated upon the tumor or tumors were of sufficient size to cause pressure, displacement forward of the soft palate and even extend below the margin of the soft palate. However, in this particular case, only one of the tumor masses extended into the nasopharynx, while the others turned forward and completely blocked the right nostril, and by their gradual increase in size had displaced the bony septum to the left, occluding the nostril. Third, the growths did not follow the line of least resistance. Fourth, there was practically no hemorrhage. Fifth, each tumor was pedunculated. Sixth, there was no involvement of the ear. Seventh, there was no evidence of sinus involvement except the pain, and after the removal of the tumor this entirely disappeared. The right nostril was entirely blocked by the new growth and there was marked disfigurement at the inner angle of the right eye. The patient suffered considerable pain only over the region of displacement and swelling. When the growths were removed the index finger passed into the nasopharynx could be carried forward through this enormously dilated nostril. The bony septum seemed to have been softened by the pressure and inflammatory process and was easily forced back into the median line by means of the nasal dilator and remained in position without the support of nasal splints.

The last time I examined the patient, some six weeks after the operation, the nasal passages were in good condition and practically of equal size.

1517 Walnut Street.

XXIII.

CYSTS OF THE NASOPHARYNX.

By Richard H. Johnston, M. D.,

BALTIMORE.

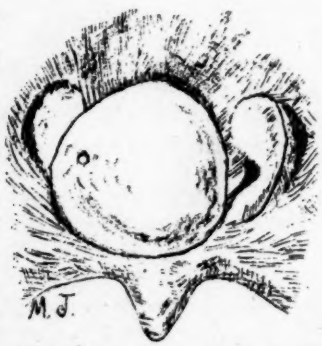
Surgeon and Pathologist to the Presbyterian Eye, Ear and Throat Hospital; Lecturer on Diseases of the Nose and Throat in the University of Maryland.

Cysts of the nasopharynx are of two kinds; one, usually small, occurring in the roof of the cavity and enveloped by adenoid tissue; the other, much larger and more important, growing from the pharyngeal vault or from the posterior end of the inferior turbinated body. The former variety is comparatively common and is formed by the obliteration of the external orifice of the pharyngeal bursa under the influence of an inflammatory process; they are analogous to the lacunar cysts of the faucial tonsils. The latter variety springs from the lateral remains of the pharyngeal tonsil, which are usually irregular and more or less mammillated. They are formed by the obstruction of a single mucous gland, the excretory canal of which has been obliterated by an inflammatory process. In speaking of cysts of the nasopharynx, Morris Schmidt says that they are fairly common on the roof, where they arise either from purulent follicles or as retention cysts of acinous glands. It is the latter variety of cysts which will be dealt with in this paper, since they are rarer and cause more urgent symptoms than the former.

Cysts of the nasopharynx were studied as far back as 1863 by Czermak and later by Tornwaldt. They occur between the ages of 20 and 50 years, and statistics indicate that they are more frequent in males. Here is the clinical history of a case seen by me in February of this year: Miss S. J. R., aged 50 years, had experienced for some years difficulty in breathing through her nose. By day and by night she was compelled to keep her mouth open to obtain sufficient air. The trouble had increased slowly, and though she had consulted a specialist, her condition did not improve. For twelve

months she had had severe asthmatic attacks, which would awaken her from a sound sleep and cause a sensation of impending suffocation.

From time to time she would have acute laryngitis with marked hoarseness. The onset of the asthma had alarmed her greatly. When the patient consulted me, she presented all the symptoms of a confirmed mouth-breather and was in a bad condition generally. Examination of the nose showed a decided deviation of the septum to the right, so that it was impossible to get much air through the right nostril. In the left nostril the inferior turbinate was in a state of intumescent hypertrophy. Turning my attention to the throat, I found the right tonsil enlarged, with deep follicles. The pharynx was dry from the continued mouth breathing. The



Cyst of Nasopharynx, Author's Case.

throat was so irritable that cocain had to be applied to get a good view of the nasopharynx. With the mirror a large round tumor was seen completely blocking up the nasopharynx. The color of the mass was gray at some points and pink at others. To the probe there was imparted a distinctly doughy sensation. The growth was almost on a level with the border of the soft palate. The color and general appearance reminded one of a fibroma. The sensitiveness of the throat was so pronounced that it was not possible to palpate the tumor with the finger. The point of attachment could not be seen since the nasopharynx was practically filled with the growth. I was undecided as to the diagnosis, and, as the patient dreaded an operation for the removal of

the tumor, I proposed straightening the septum first. This was successfully accomplished by the submucous method and the obstruction in the right nostril entirely relieved. The patient suffered no pain, and, her fear of operative procedures being somewhat removed, I suggested a second operation for the removal of the tumor. I first tried to pass a wire around the mass through the nose, but on account of the almost complete obliteration of the nasopharynx, this was not successful. Then an effort was made to snare the tumor through the mouth. Though the mucous membrane was treated with a 20 per cent solution of cocain, the nasopharynx would not tolerate the finger long enough to slip the wire around the growth. The fact that the attachment could not be seen, made the undertaking much more difficult. Finally, a general anesthetic was proposed and accepted. Under ether anesthesia, a finger was passed into the nasopharynx and an attempt made to slip a wire around the growth. There was a sudden rupture of the cyst with collapse of its wall and the escape of a thick, dark grumous fluid. Since only the cyst wall remained, the wire could not be used. With cutting forceps under the control of the finger, the wall was removed piecemeal, as well as possible. The patient made a good recovery from the operation. A few days later the mirror showed the remains of the cyst wall; these were cauterized with the electric cautery through the nasopharynx, with the result that the growth has entirely disappeared and the patient is perfectly well. The pieces removed with the forceps were hardened in alcohol, imbedded in celloidin, sections cut and stained with hematoxylon and eosin. They were made up of connective tissue covered externally and internally with cylindrical epithelium. The contents of the cyst were lost during the operation.

Cysts of the nasopharynx, if small, may cause no symptoms. But as they increase in size, symptoms of nasopharyngitis develop. The patient may complain of defective hearing and tinnitus caused by a tubal catarrh. Still later, nasal obstruction is experienced and sometimes reflex disturbances appear such as asthma or spasmodic cough. The patient becomes a mouth-breather. If the nostrils are large, the tumor can sometimes be seen by anterior rhinoscopy. In the above case, by shrinking the turbinate in the left nostril, the grayish reflex of the mass could be seen. The growth of a cyst is usually slow; it may be several years before symptoms of

urgency develop. When it has attained a considerable size, it may burst from an attack of sneezing or vomiting, but it is quickly reproduced. The prognosis is good, especially if the patient will submit to surgical treatment. If the cyst is large, it is impossible to determine its point of origin. In the above case one could not determine the point of origin until most of the wall had been removed. A cyst might be confounded with the so-called cystic polypi, which develop in the nose and attain their full growth in the nasopharynx. I have never seen a cystic polyp as large as the cyst described above, and they have invariably been move movable. A mistake, however, is not of much consequence, since the treatment is practically the same in both cases. In looking up the literature, one is struck with the little or no attention paid to cysts of the nasopharynx in modern text books. They have practically nothing to say on the subject. The above cyst is the only one I have seen; I did not make the diagnosis until I ruptured it in the efforts of removal. The most complete article on the subject is probably that of Escat in his "Maladies du Pharynx." A more careful study of cysts would be of great value in the early diagnosis of the condition.

919 North Charles Street.

XXIV.

A CASE OF CARCINOMA OF THE MIDDLE EAR, PROBABLY ENDOTHELIOMA.

By W. Sohier Bryant, A. M., M. D.

NEW YORK.

The patient was a man 41 years old, very fat, extremely nervous and painfully apprehensive. The previous history was acquired for the most part at intervals throughout the course of the disease. At the first visit the evidence pointing to malignant growth was nil, save for the unusual appearance of a polyp in the external canal. The weight of evidence afforded by a study of the symptoms favored a diagnosis of ordinary chronic suppuration of the middle ear with acute involvement of the mastoid cells. The patient said that he had a discharging ear in childhood following measles, but could give no definite account of subsequent aural difficulty until the onset of the present trouble. He had eaten and drunk excessively for many years, but had kept himself in very good physical health by constant out-of-door exercise. For the past five years he had noticed that the right eyebrow was somewhat lower than the left. He admitted the existence of a primary luetic lesion some years previous to the time when he consulted me. His brother thought that the patient had been peculiar mentally for two years or more. About a year ago the patient found that he did not hear well, and that there was a pulsation in the left ear. He had a cold in the head at that time. His brother noted that the patient had spilled a great deal of food over his clothing for some time past. The patient ten months ago first noticed pain at the top of the head. Seven months ago he noticed that the left ear was covered with "pimples" (probably herpes), which persisted for ten weeks. He remembered that he had shooting pains in and around the left ear and mastoid process, together with ringing noises six and one-half months ago. Six months ago, headaches and twitching of the face began. Three months ago the patient had severe pains in left lower bicuspids. These were pulled out and found to be perfectly normal. Very little pain was

caused by the tooth extraction, but the lower jaw felt numb. The pain in the jaw persisted. About that time he had an attack of bronchitis, accompanied by the pouring out of an abnormal amount of thick mucus from the left side of the nose, and pain and discharge in the left ear. Two months ago he first noticed that he had double vision, a condition confirmed by Dr. Arnold Knapp at about this time. Six weeks ago the patient noted that he could not hear in the left ear. A month ago facial paralysis was noticeable. Two weeks ago the patient noted that left side of forehead did not wrinkle.

Family History.—The patient's mother and two maternal aunts died of cancer of the breast. One of his sister's sons, a young man, died of malignant disease of the intestines.

Examination.—A hard, flat polypoid granulation filled the fundus of the meatus. It had an unnatural look, and was smoother, harder, flatter and paler than a true granulation, and apparently was attached to the promontory. It was not sensitive. There was a slight tenderness of the mastoid process. A fork having 512 single vibrations, when placed on the glabella, was referred to the left ear. Patient was very deaf in the left ear; he could hear no fork by air conduction below 512 single vibrations. Bone conduction was fair. The nose was not much obstructed save by slight hypertrophy and thickening of the septum on the left. He thought his sense of smell on the left was not as good as it used to be, and that the saliva did not flow as well on that side as formerly. His voice was a little thick. Tongue deviated to left. No dizziness. Pain in top of head and cheek.

Dr. Ward A. Holden examined the eyes. He found the left pupil sluggish and slightly irregular. The fundi oculi were normal. Vision 20/15ths each. Double vision, images horizontal; diminished sensation of face; paralysis of left external rectus; knee jerk exaggerated.

Dr. George S. Dixon made a blood examination and found: Red cells, 5,540,000; white cells, 8,200; hemoglobin, 90 per cent.

The differential count was as follows:

Small mononuclear	36.6 per cent.
Large mononuclear	7.8 per cent.
Transitional	3.4 per cent.
Polynuclear	51.2 per cent.
Eosinophile	.4 per cent.

Mast cells	.2 per cent.
Myelocytes	.4 per cent.
	100 per cent.

At this time the pulse was 100 and the temperature 100.5° F. by mouth.

When first seen on August 2, 1906, the writer made a diagnosis of otitis media purulent chronica of the left ear with slight mastoiditis and nerve complications, but on the following day he changed it to syphilis of the ear because of the atypical polyp. The patient received the usual treatment for chronic suppuration of middle ear. Later on iodid of potassium was given.

During the second week of observation, the patient would not be controlled in any way. He could not sleep without twenty grains of veronal and one grain of codein at night. The left ear showed only a little serous discharge in the meatus. The polypus appeared to fill the tympanus and was most in evidence above and in front. Pulse, 80; temperature, 98.6°. There was dull pain in the temporal region, behind and in front of the ear and also in the occiput. After removal of some fragments of the growth with forceps, the stump came down and replaced the portion which had been removed. The diagnosis of malignant growth was now made, most probably sarcoma, because of the hardness.

Dr. George S. Dixon reported that a stained section from the specimen removed was negative. He said that the curettings submitted showed a mass of crystalline material—indefined in form, and hence unrecognizable—possibly cholesterin, together with general detritus such as one would expect to find in a chronic suppurating middle ear. In addition some granulation and new-formed connective tissue were present. He found nothing to indicate malignant disease, or lues. He was of the opinion that (if cholesteatoma could be ruled out) the patient had an ordinary chronic suppurative otitis with the formation of granulation tissue, some of which under favorable conditions may be converted into connective tissue.

Third Week of Observation.—Patient had pain above the left ear in temporal region. Voice thick. Inner end of canal seems to be contracting. Facial paralysis quite noticeable. Dr. Edwin G. Zabriskie noted the left pupil did not react as quickly to light as did the right, and that the patient could

not open left side of mouth as wide as right. The patient heard the tuning fork (512 S. V.) on the right mastoid process and referred it to the left ear. Paresis of facial movements least in frontalis muscle. Pulsating tinnitus. Watch not heard in left ear by air or bone. Probing growth causes pain in gums on left. Some occiptal pain. Growth has entirely filled fundus of meatus since the curettement and has increased chiefly anteriorly.

Dr. E. G. Zabriskie's Examination.—Complete loss of sense of smell. Sensory innervation of face all right except left lower angle of mouth, which reacts to a prick only.

Fourth Week of Observation.—Paralytic symptoms much increased. External rectus absolutely paralyzed. Tongue is markedly deviated to left. The left eye closes voluntarily, but with difficulty. It does not wink. He can not whistle. Pains largely occipital and parietal as before. There is no feeling in temporal region back of eye. Paralysis of sensation most marked under eye. Hemianesthesia of head and considerable redness. Fork 512 single vibrations heard slightly by air conduction in left ear. Bone conduction distinctly better in left ear than in right. Touches tip of nose with tip of forefingers readily with shut eyes. Cerebration a little slow. The growth was wiped with 1-500 bichlorid of mercury, which has a retarding effect on it. It is lobulated and slightly larger than before. Muscles of mastication do not contract on left side. At this time the growth was snared and curetted and all diseased tissue that could be seen was removed. It was sessile and hard, especially in its anterior portion. The membrana tympani and malleus when uncovered appeared intact except where the membrane was torn in front by the manipulations. The growth apparently sprang from the anterior portion of the annulus tympanicus.

The bone of the inner end of the meatus and tympanic was scraped. It appeared sound. After the curettage the meatal walls were hard and intact. The walls of the inner, anterior and upper tympanum could not be examined on account of the ossicles and membrane. A few hours later the growth had been pushed out, obliterating part of inner end of canal. The end of the stump was ragged, showing that the growth had been extruded and not propagated at its periphery.

Dr. Edward G. Zabriskie's report of the histologic examination of the second specimen removed said that the

granulations showed a faintly strained stroma of compact connective tissue fibres and irregularly scattered throughout this, more particularly in the lymph spaces, were groups of round cells closely packed together, which in certain places appeared to be springing from the endothelial lining of these spaces. These cells, the nature of which it was rather difficult to determine, because of their poor nutrition and consequently poor straining capacity, appeared to be crowding along the lymph channels. In some instances they were carried along by the stream or pushed from behind and in others sprang directly from the walls of the channels. They were most probably invading masses from the central growth which was as yet quite inacessible. There were no direct evidences of a specific granuloma in any of the sections that he examined, nor were there any of the definite vascular changes that one would have expected to find in this condition. He considered these sections as indicative of a malignant growth, and was rather inclined to consider it an endothelioma. Of course, it was quite impossible to state the origin of the growth from the evidence at hand. Dr. Zabriskie found some cartilage in the growth, which was probably a portion of the orbicular cartilage.

Dr. George S. Dixon reported that the last tissue submitted from the canal showed that the operation had been more successful in obtaining a portion of the tumor. The fragments indicated the presence of carcinoma.

The writer had the privilege of examining the sections made by both Dr. Dixon and Dr. Zabriskie, and was convinced of the correctness of their observations.

Following the removal, the patient thought his ear better, but other head symptoms worse. Valsalva's inflation negative. Walks a little unsteadily in the dark. Speech very thick. Can't drink without spilling at corner of mouth. Eye does not quite close. Left middle turbinate close to septum, but shrinks with adrenalin.

Fifth Week of Observation.—Left ear hears the low forks faintly by air. Upper forks heard chiefly by right ear.

Dr. Ward A. Holden reported pupils normal, but found a neuroparalytic keratitis.

Dr. J. Ramsey Hunt saw the case again and reported the cranial nerve symptoms unchanged. He referred disturbance of taste to the trigeminus rather than to the chorda tympani, because patient could not detect salt, sweet and sour

on the left. The palate was distinctly paretic on the left. The iodid seemed not to have any effect. He advised mercury by inunction or hypodermatically.

The patient is unable now either to sleep or to eat anything solid because of the pain. No pain in ear. There is great mental depression. Fork heard in left ear through bone from all parts of head. When the right meatus is closed with the finger he hears the fork by bone from all parts of the head only in the right ear. Pulsating tinnitus on the left. Annoying pain in the left eye, forehead, vertex, occiput and back of jaw, etc. A reflex light on growth shows a slight pulsation. Meatus fairly wide open, showing what appeared to be membrana tympani posteriorly and superiorly. Can't stand on one foot with eyes shut, but does so easily with eyes open.

Sixth Week.—Codein 1-1/2 grains and 15 grains sulphonal at night. Pain less. Meatus now completely filled at inner end. Some necrosis caused by the local application of bichlorid of mercury. The growth was coming outward along the anterior wall of the meatus. Crystal bichlorid of mercury applied to growth. More difficulty in talking and eating. Most of the pain was in lower part of forehead and about eye. Is still able to feel hard pressure on face. Paralysis of seventh nerve not quite so marked about eye. Left nares is becoming stopped with hard material. Patient said dizziness was increasing. Paralysis more marked.

Seventh Week.—Postrhinoscopic examination prevented by retraction of palate and exaggerated pharyngeal reflex, gagging and vomiting. Left nares stopped up posteriorly. Auditory meatus slowly filling from the fundus with the hard growth. Complained of more dizziness and double vision. The dizziness is probably from the double vision in eye. Convergent strabismus of left eye noticeable. Postnasal digital examination found the end of left inferior turbinate. A soft uneven surface lay above it, but was out of definite reach. Tears flow on left cheek. Metallic taste in mouth has been marked. Left pupil a little larger than right, it reacts to light and accommodation. Patient extremely fearful of death or operation. Dr. Holden could note no change in the eye.

Eighth Week.—Operation under ether. Made the usual postaural mastoid incision. Removed the posterior, upper and anterior wall of the osseous meatus. Both bone and soft

tissue with the malignant growth were stripped from the walls and the tympanum and Eustachian tube were cleaned. The dura mater of the middle and posterior fossae was fully exposed. It appeared perfectly normal. Washed out with cold saline; packed the meatus lightly with iodoform gauze. One deep suture and metal clamp external suture. The growth was not attached anywhere except in the fundus of the meatus anteriorly, and in the Eustachian tube. It did not appear to involve the bone. No lead could be found in any direction. The operation did not continue to the apex or the pyramid because the patient had absolutely refused to allow any intracranial exploration.

Ninth Week.—First day of convalescence. Changed outer dressings. Much depressed at times. Consultation with Dr. Charles H. Knight about swollen tongue from injury during anesthesia. Second day: Paralysis of facial and chorda tympani seemed better. Less metallic taste in the mouth. Less facial paralysis. Orbicularis of left eye acts strongly. Dressings only slightly stained. Changed packing in the meatus. Removed the metal skin clamps. Wound healing by first intention. Third day: Wound firm and solid. Changed gauze in the meatus. Fourth day: No sign of suppuration in ear. Sixth day: Facial paralysis marked. Eye does not close. Pain has been bad again. The fundus of the canal nearly healed. It has collapsed somewhat at bottom. Slight serous discharge. When the fundus of the ear was wiped, deep pain was felt in jaw at the place of the tooth extraction.

Tenth Week.—Seventh day of convalescence. Some pain in brachial plexus, relieved by chloroform liniment. A growth is visible in the meatus on the inner anterior wall in about the former position. Removed the excrescences with forceps. Eighth day: Slept well. Feels pretty well. In consultation Dr. C. L. Dana suggested a basal cranial radical operation. Growth in meatus spreading and meatus narrowing. Ninth day: The lumen of the meatus filling up with growth. The growth on floor of meatus moves with movement of jaw. No dizziness can be detected. Dizziness increases on moving about. Has a subjective feeling of pressure at the vertex. A cotton plug saturated in 1-1000 corrosive sublimate worn in the meatus. A brawny swelling on junction of left hard and soft palates. Left nose still more occluded. Tenth day: Complains of feeling of weight on head. Consultation with Dr. Emil Gruening. He thinks growth located at apex of

pyramid and that it could be removed. Twenty-five mgr. radium bromid of 1,000,000 radio-activity exposed in meatus for thirty minues. Eleventh day: Radium forty-five minutes. Growth has considerably increased in meatus. Thirteenth day: Radium thirty minutes. Slept well. Ear looks a little smoother and cleaner. One two-hundredths bichlorid wiping. Iodid of potassium disturbed stomach and was discontinued.

Eleventh Week—Fourteenth Day.—Dr. E. D. Janeway consulted. He said that there was paralysis of the ninth nerve. Patient hears all tuning forks from all parts of the head in left ear. Fifteenth: Radium twenty-five minutes. Meatus filling in slowly with smooth hard masses. Transillumination shows large clear frontal sinus and antrum. The left antrum seems to glow more than right. Sixteenth day: General condition better. Nasal breathing worse. Pain in gums of lower jaw and left side of nose. Seventeenth day: Face seems to show more motion. Occipito-frontalis moves a little. Adrenalin opens right nose completely; left nose shrinks anteriorly but not posteriorly. Pain chiefly in lower jaw, where tooth was pulled, a little also in nose and cheek. Radium fifty minutes. Ear seems to have closed little since last observation. Eighteenth day: Consulted Dr. Joseph Collins. He advised immediate radical operation. Ear looks a little better. Double vision, sees an object to one side and above the other object. Ataxia slight. Nineteenth day. Radium seventy minutes. Morphin. Pupils large. Fundus of ear now open and pale. Twentieth day: Consultation with Dr. J. R. Shannon. He said that there was slight commencing optic neuritis. Corneal irritation was due to facial and trifacial paralysis, and to external applications for eye pain. Diminished visual field. External rectus the only eye muscle affected. Slight convergent strabismus. Subcutaneous use of bichlorid of mercury discontinued. Pain in face very bad last night. Pulse, 100; temperature, 99°.

Twelfth Week.—Vomiting. Feels worse every day. Pain continues to increase in whole side of head, face and neck, temples and vertex. Eye and gum pain the most intense. Feeling of weight over left vertex. Pain not controlled by morphin. Almost sleepless. Voice quite husky. Left nasal fossa closing fast. Probe will not pass. Left pupil smaller than right, sluggish and reacts little.

Thirteenth Week.—Consultation with Drs. Harvey Cushing, Joseph Collins and J. B. Walker. Dr. Cushing said that he had operated on several similar cases. He thinks the ear growth had nothing to do with the paralysis; that the paralysis of fifth and sixth cranial nerves and the pain were due to pressure on the Gasserian ganglion; that the growth closing left nares has penetrated skull and lifted Gasserian ganglion and at same time pressed on seventh nerve. Thinks removal of Gasserian ganglion would relieve pain. Said the ophthalmic and pupillary disturbances are due to contiguity of the nerves, and that the lingual and facial paralysis are only apparent and are due to loss of muscular sense. Said optic disc showed changes. Patient complains of most pain in vertex and left side of head. Slept little and ate less. Occasionally says the wrong word for things. Much vomiting.

Fourteenth Week.—Fundus of meatus filling slowly or collapsing. Pain in occiput. Worst pain in lower jaw and eye. constant. Eye red; exophthalmos, trophic conjunctivitis. Excoriation of left brow, nose, lip, chin and gums from picking with finger-nails. Losing weight fast. Nose more stopped, full of bloody mucus. Swallows into trachea. Ear unchanged. Consultation with Dr. F. H. Bosworth, who said there was paralysis of left recurrent laryngeal nerve and left vocal chord; that is, paralysis of left pneumogastric and glossopharyngeal nerves. Said there was paralysis of the left palati. Also an enlargement on the posterior end of lower turbinal.

Fifteenth Week.—Failure of physical and mental strength is marked. Left nares constantly full of thick mucus, which is very annoying, as he cannot dislodge it. Since operation has had no pain in or about the ear; pain chiefly in eye, gum of lower jaw, in nose and side of nose. More pain now in vertex and occiput. Fundus of auditory meatus filling up slowly, probably collapsing. Soft palate as seen by mouth has an antero-posterior furrow with bulging on each side, most marked to left, hard on left side, soft on right. Patient often chokes from inhalation of saliva and food. Fear of choking makes him sleep in the erect position. Had a hard lump in left anterior supraclavicular region.

Sixteenth Week.—Ear remains dry. Palatal induration extending to right side. Pulse weaker, rate as usual. Ear filled up about as much as before operation. Physically, a little weaker, mind a little better ;ear, eye, nose and throat dry.

Some enlarged glands under angle of left jaw. Thickening in palati region is increasing and extending. Pain in eye, gum, cheek, left parotid and lumbar region. Feels feverish.

Seventeenth Week—Nose still further occluded. Palate a little fuller. Has had "sticking" pains in vertex of left nose and a little in left ear. Gums of upper left molars ulcerating on inner side. No bone conduction in left ear. Tuning fork not heard on left mastoid, but is heard on right. Complains of dry throat. Left nares contains bloody, thick mucus. Left pupil smaller than right. Right pupil dilated. Says morphin does not stop pain unless it stupefies him, but it lessens it.

Nineteenth Week.—Has had a large lump in lower carotid triangle for a week. Much severe pain, fifteen grains and more of morphin daily. Regurgitation through nose. Losing strength rapidly, weight not much changed.

Twenty-second Week.—Looks as if he had lost more weight. Is very despondent. Twenty-five grains of morphin daily. Facial and other paralysis more marked. More exophthalmos. Hard lump over masseter muscle, left angle of jaw, below jaw and at level of cricoid cartilage. Palate growth larger, more prominent and red. Anteriorly, it is pale and shows dark brown ecchymosis. Speech more difficult and exhausting.

Twenty-fourth Week.—Had violent attack of dyspnea at stool. More than fifty grains of morphin daily. Pleuritic effusion on left.

The courtesy of Dr. C. R. Putnam, who had charge of the case toward the end, provides us with the following notes: The patient took large quantities of food. At first he swallowed into the trachea, because the throat was anesthetic, but he finally learned to swallow without difficulty. He had a metastatic growth in the mediastinum, which pressed the trachea to the right, causing orthopnea for several weeks before death. He had severe thoracic pains, took fifty grains of morphin daily. Atropin, strychnin and nitroglycerin were used when indication presented themselves.

Twenty-sixth Week of Observation.—January 21st: Died after three days of dyspnea. Did not get out of chair or go to bed for fear of choking. Used chloroform to ease severe dyspnea. Loss of weight had been slight of late. Weight about 200, formerly about 230. Death occurred from thoracic rather than from intracanial causes. The ear had remained cicatrized to the last. Submaxillary lymph glands hard and as

large as pigeon's egg. Swelling on ramus of left lower jaw. Largest single dose of morphin was twenty-six grains.

SUMMARY.

CHRONOLOGICAL SEQUENCE OF SYMPTOMS.

Running ear. Right eyebrow drooped. Mental change. Decrease of hearing in left ear and tinnitus. Pain in vertex. Herpes of the ear. Pain in and about the ear, headache, twitching of face. Severe pain in teeth and numbness of jaw, first noted trouble in the nose. Double vision. Total deafness left ear. Marked facial paralysis.

ANALYSIS OF SYMPTOMS.

The ear had been affected many years when mental changes were noted. Functional disturbances of the ear. Painful symptoms in the vertex. Herpes of the ear indicating nerve lesions near the geniculate ganglion (Hunt). General headache and pain in and about the ear, functional disturbance of facial nerve. Functional disturbance of fifth nerve and disturbed nasal function. Disturbance of the external rectus.

ANATOMIC EFFECTS.

We have followed the history of a cranial lesion first definitely affecting the function of the ear probably by encroachment on the tympanum near the orifice of the Eustachian tube; next it is located in the neighborhood of the geniculate ganglion; there is definite facial nerve affection; definite affection of the inferior maxillary branch of the fifth nerve and disturbed nasal function; paralysis of the sixth nerve supplying the external rectus. This lesion progressing from the tympanum and Eustachian tube, encroaching on the geniculate ganglion and causing definite motor disturbances of the facial nerve, progressed inwards, affecting the inferior branch of the fifth nerve and then forwards and down along the Eustachian tube, appeared in the posterior nasal fossae, and traveled backwards and downwards, affecting the sixth nerve. The involvement of the other branches of the fifth was probably caused by involvement of the Gasserian ganglion. The paralysis of the tenth and eleventh cranial nerves was affected by the spreading of the growth down-

ward and backward along the basilar process of the occipital bone. Metastases were all in the anterior triangles of the neck or in the mediastinum.

The etiologic importance of syphilis was probably nil. There was a very strong malignant inheritance.

COURSE, DIAGNOSIS AND TREATMENT.

The course of the disease was about two and a half years. The more definite period was about eighteen months. The marked symptoms lasted about six months, the grave symptoms about three months.

The case was an important one. The patient consulted eighteen specialists and received every care and attention possible.

The definite diagnosis was delayed for some time after the patient was first seen on account of his extreme horror of anything in the nature of an operation. This attitude prevented satisfactory microscopic examination of the growth. He utterly refused to submit to any more operating.

The long interval which elapsed between the commencement of the first symptoms of the growth and its exenteration was too great for a simple removal. At the time of operation it was far too extensive to have been eradicated by the tympanic operation. The result of the operation was a lessening of the discomfort referred to the ear and apparent cessation of the growth in the ear. This good local result, the author believes, was due to the post-operative use of radium.

The result of the operation suggests the possibility of a successful total extirpation if an operation could have been performed when the symptoms were first definitely noted.

The final course of the disease made it clear that an extensive radical operation would have made the last days of the patient more comfortable, if not more numerous. Unfortunately, however, he would not submit to it.

XXV.

ATROPHIC RHINITIS: ETIOLOGY AND TREATMENT.

By Joseph C. Beck, M. D.

CHICAGO, ILL.

It is the article of Richards, read at the last meeting of the American Medical Association, that prompts me to bring this subject for your discussion for two reasons: First, he appeals that more attention be given in our medical society meetings to this most discouraging chapter in rhinology; and, secondly, he ignores, in a measure, the sinuses in relation to atrophic rhinitis.

I will say at the outset that, believing that the sinuses and their involvement, whether primary or secondary, have much to do with atrophic rhinitis, I do not consider it to be the most discouraging chapter in rhinology. It is my purpose to report a number of cases of this affection in which radiographs were taken to determine the involvement of the various accessory sinuses of the nose. This fact was proven by operation. I also wish to report in connection with these cases, which are twenty-four in number, several methods of treatment which have not been brought out very extensively in the literature, some, so far as I am able to find, original and of benefit in this affection.

The literature on atrophic rhinitis is so vast that I shall not take it up, only in so far as it relates to cause and treatment, and that very briefly.

Zaufal, Heymann and Hopmann are of the opinion, based on many investigations, that the cause lies in a congenital atrophy of all the bones of the nose, and in a lack of vitality of the mucous membrane. These individuals are, as a rule, predisposed to catarrhal conditions.

E. Fraenkel, Loewenberg, Abel and Hajek have found the cocca-bacillus and the bacillus mucosus as the probable cause of this affection. Schlafrig ascribes it to the sarcina, and Bel-

fanti and della Vedova, to the pseudo-diphtheria bacillus. One of the most interesting observations is that of Perez, carried on at the Pasteur Institute, where he claimed to have found the pathogenic microorganism called the cocca-bacillus foetidus ozenae. He injected pure cultures of these microorganisms into the veins of a rabbit, and produced marked atrophic changes in the anterior turbinated body, which corresponds to the inferior turbinated body of man, when examined histologically.

Most authors still believe that the primary cause is some violent infection of the nose, such as accompanies scarlet fever, measles, diphtheria. A chronic hypertrophic condition appears and on account of general malnutrition, with the eventual development of the specific microorganisms on such good soil, the atrophy develops and goes on rapidly or slowly, according to the resistance of the tissues and medical interference.

Zarniko believes that this affection is due to a trophoneurotic change in the mucous membrane and bone. Stoerk believes that congenital lues or gonorrhea in the parents is responsible for many cases.

Recently much attention has been given to the involvement of the sinuses and their chronic discharge as being responsible for this affection. Michel, Hajek, Grünwald and many others are of this opinion.

Post-mortem examinations made by Wertheim, Oppinkoter, Krause, Hartmann, Harke and Fraenkel would all disprove that the sinuses have anything to do with the causation of atrophic rhinitis. Grünwald, Hajek and others, however, answer them by saying that, as a rule, anatomists do not make a very careful examination of these cells, and that in many cases the mucous membrane does not show great microscopic changes. Again, it is not necessary that all or many cells need be affected. One or two of the ethmoidal cells only on each side can cause an atrophic condition. From my reading of Hajek's twelve cases and his deductions, I am convinced that atrophic conditions can be caused by affections of the sinuses. Besides, he has reported two cases of marked adenoid hypertrophy with atrophic rhinitis, removal of which was followed by marked regeneration of atrophic condition. This regeneration he observed in most of his cases of partial atrophy when he cleared away the sinus disease. He believes that the atrophic condition develops when the tenacious discharge

is deposited over the inferior or middle turbinated bodies; here it causes destruction of the cellular elements; the epithelium develops in marked stratification; there is a secondary contraction of the underlying connective tissue with a vascular anemia and starvation, finally causing bony atrophy. He absolutely denies that the discharge usually found in the nose in atrophic cases is secreted by the turbinated body, as claimed by Zuckerkandl.

Chiari is absolutely against the assumption that sinus diseases cause this affection, and brings forth the claim that atrophy occurs in children as young as two and a half years old; one cannot certainly expect that this large amount of discharge can come from the extremely small accessory sinuses of children.

D. Braden Kyle writes very exhaustively on the subject of causes and classifies them particularly from the pathologic point of view. As to the sinuses, he says they may be primarily or secondarily involved. No credit is given to the bacterial cause of this disease.

General constitutional diseases, according to this author, are responsible for many cases of atrophy, such as syphilis and tuberculosis, and atrophy is frequently associated with kidney, heart and lung diseases, causing an over-abundance of blood (passive congestion), with secondary contraction and final atrophy. He also believes in a trophic cause of atrophic rhinitis. Much stress is laid on the difference between atrophy and degeneration. The former occurs first; degeneration second.

So far, then, nothing has been said as to radiograms estimating sinus involvement in this disease, and the consistency of bony structures of the turbinate and other bones of the face.

The technic of taking radiograms in this disease is the same as when we wish to determine sinus diseases. I have always made two exposures, one lateral and one anterior. The patient's face is put directly on the plate and immobilized by a compression apparatus, and he is instructed to be absolutely quiet, not even to breathe or move the lids for sixty to eighty seconds. This is accomplished by the patient signalling with his finger when he cannot hold his breath any longer; then the current is severed and the patient is again allowed to breathe, and the procedure is repeated until the full length of the exposure is made. The lateral view is exposed for from fifty to sixty seconds, and the antero-posterior for eighty

seconds. The tube is placed back of the head about fourteen inches from the occiput. The plate is developed in the usual photographic manner, and after it dries it is examined by means of transilluminated light in a dark room. The plates are of diagnostic value, while the prints of them are, as a rule, very unsatisfactory, an unfortunate fact regarding the publication of the plates. The antero-posterior views are best for judgment of the frontal, antral and anterior ethmoidal sinuses, while the sphenoid and posterior ethmoid can only be seen in the lateral view. However, the superposition of the two sides makes this view not very satisfactory for diagnosis, except in connection with the physical examination.

The involvement of a sinus is judged by its density; while I am not absolutely certain that the skiagraph is true in every instance, it is, in the majority of cases that I have examined and opened. The cavities are shown as dark areas, whereas when filled with pus, thickened mucous membrane or granulations, they are shown as whitish areas, similar to the surrounding solid bone.

Of the twenty-four cases of atrophic rhinitis that I radiographed, I found the sinuses involved in all but three cases, and these were of the light type of atrophy.

TREATMENT.

Most of the authors treat the symptoms of odor and obstruction, due to the crust formation, and only the minority consider the pathology in this regard. Hajek, Grünwald, Braden Kyle and Onodi are some of the latter, and it seems their results are much better. Personally, I am of the opinion that the condition may be primary in the nose or sinuses, but that in the majority of cases, when treatment is directed towards these accessory cavities, in addition to the nasal and general treatment, the results are better. The literature is full of cures and marked benefits from ever so many different methods of treatment, and that fact alone is enough to show that we have no specific treatment applying to all cases. The essential fact, I believe, as to the treatment is to remove the cause and then establish hyperemia, which will be followed by resolution, either partial or complete.

As to the methods of treatment that I have followed in my cases, I will report specifically in each group, for I have divided them up into six groups so as to be able to control my experiments. The methods were:

1. Irrigation in the areas of the ostea of the various sinuses, or of the sinuses directly by means of a solution composed of iodin, formalin and sodium chlorid, associated with the suction method, as recommended by Sundermann or Brawley.

2. Operative interference, usually intranasally, by removal of the middle turbinated body, currettement of the ethmoid cell, removal of the anterior sphenoidal wall, and a large opening into the antrum of Highmore at the inferior meatus, with or without the removal of a portion of the inferior turbinated body. I do not need to say that in each case all these sinuses were so operated on only when absolutely indicated.

3. Paraffin injections into the inferior turbinated body.

4. The use of high frequency current into the nasal and pharyngeal spaces.

5. Bier's treatment, such as constriction band around the neck, and Rethi's method of compression at the posterior choanae and Sundermann's method of constant suction.

6. Vapor therapy, by means of the Bulling's vibrator, using the same solution as for irrigation, only stronger.

I have come to some definite conclusions as to the value of these various methods of treatment, and will report in detail, as said before, in connection with each group of cases.

From the foregoing, it will be apparent that my treatment is principally directed to the sinuses. All other treatment is used to promote resolution or restitution of the atrophied structures by means of hyperemia and leucocytosis.

These twenty-four cases were divided into groups in order to be able to judge and compare the various methods of treatment, and each group of cases will be reported by taking one typical case as an example.

GROUP I.—SEVEN CASES.

Case I.—Miss M., 17 years old. Father and mother and six brothers living and well. None have any trouble like the patient's. She had the usual diseases of childhood. Ever since she can remember she has had trouble in her nose, as discharging of accumulation of crusts of a foul odor. She herself cannot smell them. Suffers much with headache, and is frequently dizzy. Her throat is constantly dry, making her cough, especially in the morning. Her appetite is markedly diminished. There has never been any ear trouble.

Status—Poorly nourished young woman; very anemic. Blood examination shows a lack of hemoglobin, and diminution of red blood corpuscles. Urine negative. Nothing pathologic, apparently, in the gastro-intestinal tract, heart and lungs, and genito-urinary tract or the cerebro-spinal system.

Nasal examination shows a bilateral atrophy of the inferior turbinated bodies, with apparently enlarged middle turbinated. Membrane of the whole cavity of an anemic character, with minute ulcerations scattered all over the cavities. Posterior wall of pharynx and Eustachian orifices are clearly seen through the anterior nares, and appear very dry. There is no pus escaping from any of the ostea. Epipharynx and mesopharynx are dry and apparently thinner than normal. Larynx and trachea negative. Ears negative.

Examination of eyes: No fundus lesion, only a hyperopic astigmatism; 0.50 D.

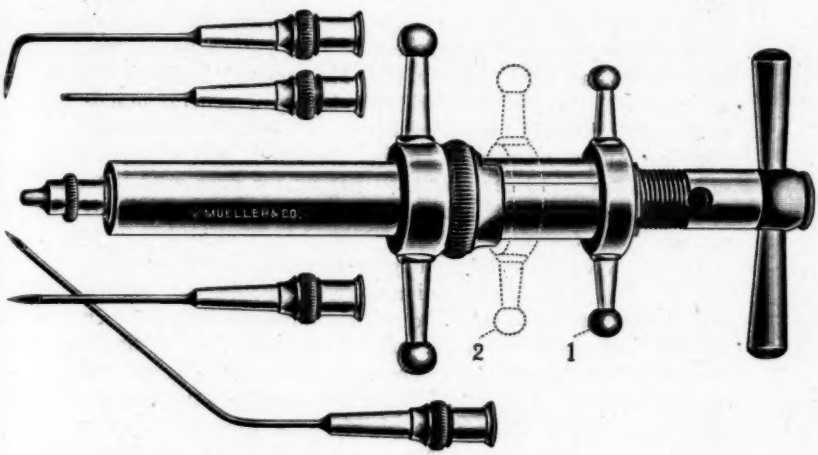
Radiogram—Shows involvement of all the sinuses, in being almost as dense as the surrounding bones. Transilluminations dull.

Puncture of the antrum revealed pus of a thick greenish color.

Diagnosis—Atrophic rhinitis and pharyngitis, associated with a pansinusitis.

Treatment—Washing out of the sinuses by means of canulas introduced into them, or in the vicinity of the ostea, using an irrigator placed ten feet high. The fluid used was a very warm iodin-formalin-salt solution. This is followed by tilting the head forward and backward to the right and left, so facilitating the emptying of the sinuses, and then using either the Sundermann or Brawley suction apparatus, for the purpose of aspiration (Bier's treatment). Only slight improvement followed this sort of treatment, and an operation was suggested of removal of the middle turbinal, with ethmoid, sphenoid and antral sinus puncture. This was accepted and done. The result was a recovery from this operative procedure, and a marked improvement in the general condition of the nasal mucosa, marked reduction of the odor, and her general condition markedly improved. Seven weeks later, a bilateral in-

jection of paraffin (cold) was done with a syringe (see figure), with a very good result of bulging of the inferior turbinated body.



Remarks—This case shows that the treatment of the sinuses was the proper procedure. The irrigation fluid of formalin, iodin and sodium chlorid is one of the best for the purpose of irrigation in this infection of which I know, and I believe the iodin acts as a particular stimulant to healthy surfaces. The paraffin is supposed to act beneficially by reconstructing the inferior turbinal, but I believe that it also acts as a nutrient or stimulant to a healthier and better blood supply, because, as I will show in other cases, much improvement followed by simply injecting a quantity not large enough for reconstruction.

The other six cases are about the same, varying in the history and general examination somewhat, but, as a whole, required the same kind of treatment and gave about the same result. It is to be observed that irrigation and aspiration treatment was tried before for a period of from six weeks to three months, but, in all these seven cases, operation was performed by the intranasal route.

GROUP II.—FOUR CASES.

Case I.—Miss C., aged 22. Father died at 53 of kidney trouble. Mother and three sisters well, and none have any trouble like patient's. She had the usual diseases of childhood, but not scarlet fever. Ever since she can remember she has been discharging crusts from the nose, of a foul-smelling character. She can smell fairly well. Her general health is always good. Has been under treatment by a general practitioner, who directed her to wash her nose out with salt solution in the usual manner of snuffing the water, and he applied nitrate of silver, 10 per cent, also packed the nose with tampons of wood wool, without any result. Never has had any ear or throat trouble.

Status—Well nourished young lady, and in apparently perfect health. Nasal examination showed atrophy of both inferior turbinated bodies. The middle turbinate looked much thinner than normal, and the sphenoidal sinus, osteum maxillare and naso-frontal duct were easily probed. The general mucosa was of an unhealthy character. The postnasal space and Eustachian orifices were plainly seen through anterior nares. The mucous membrane of the epipharynx and mesopharynx, as well as the larynx and trachea, were normal. Ear and general examination negative.

Radiograph shows the sinuses plainly involved, but not so markedly as in Group I.

Transillumination, practically dull. Puncture of antrum negative after irrigation.

Diagnosis—Atrophic rhinitis, with some involvement of a mucous type.

Treatment—Irrigation of the sinus with the various canulas, using the iodin-formalin-salt solution. Aspiration of the sinuses. Cold paraffin was injected into both inferior turbinated bodies, and it appeared as though the condition improved from the moment the paraffin was injected.

Remarks—The other three cases were almost identical, and the results are the same. These four cases are all of more than one year's standing, since treatment was instituted, and what I say of their improvement is from my recent observation of them. The crusts and odor are not present at any time, and the patients do not complain, except on a cold day, when they feel too much cold air rush into the throat. There is no washing or treatment done at home, and only general hygienic measures are observed.

GROUP III.—FOUR CASES.

Case I.—Mr. V., 25 years old. For the past two years has been under the treatment of a general practitioner for a hacking cough, taking medicines without any result. His family history is good. He has been well until the above mentioned time, and does not remember of ever being very sick or having had bad colds. For the past few months there have been crusts forming in his nose, and his folks complain of an odor, but he cannot smell it. His throat is very dry, and a thick crust forms in the back of his throat, that he thinks makes him cough.

Examination—General examination of heart, lungs, gastro-intestinal tract, kidneys and blood, negative.

Nasal Cavity: Nostrils filled with casts of crusts. Both inferior turbinated bodies partially atrophied. The middle turbinate body is thickened and covered with a thick, viscid, muco-purulent secretion. The epipharynx and mesopharynx and false vocal cords are deeply inflamed, and small crusts are formed on the latter. The larynx and trachea are also injected and red. Sputum examination: negative as to tubercle bacilli, but mixed staphylococci and bacilli were found. Lots of pus cells. Suction does not reveal any pus from sinus.

Radiograph negative, except that the ethmoid sinuses look a little cloudy.

Puncture of antrum negative.

Transillumination negative.

Diagnosis—Atrophic rhinitis, with epipharyngitis, mesopharyngitis and hypopharyngitis.

Treatment—Inhalation of vapor generated by the Bulling's vibrator, using a nasal tip for the nasal treatment, and mouth tip for the throat inhalation. The fluid used was the same as the irrigation fluid. Treatments were given three times a week, for ten to fifteen minutes, and each sitting or treatment continued until crusts and odor disappeared.

Remarks—These four cases may be classed in one group, because they all give a history of late manifestations of this trouble. They are all negative on radiographic examination. They are all practically free from headaches, and the atrophy in them all is only partial. They all got well by means of this treatment, and I only wish to say that in cases where the throat is involved, particularly the larynx, this treatment is of distinct amelioration to the patient.

GROUP IV.—TWO CASES.

Case I.—Miss M., 26 years old, nurse. For several years has had trouble with the right side of her nose, crusts forming which are of a very foul odor. Her head aches on that side very much, and she cannot see so well with the eye on that side. Her family history is negative, and she only had the grippe when she was a little girl. Since then she believes this trouble began. She has been using the douche cup for a long time, but her ears get so bad when she does so that she has abandoned that. When removing the crusts she has frequent nose-bleed. General examination negative, except a goiter.

Status.—Right Side of Nose.—Almost complete atrophy of inferior turbinate. Crusts and pus in the nose. A streak of the pus going back into the throat from about middle turbinated body. This body is very large, and the characteristic outgrowth of sinus disease springs from the region of the hiatus semilunaris.

Left Nostril—Slight hypertrophies, but otherwise negative. The throat is covered with a purulent secretion, especially post-nasally and on the right side.

Puncture of antrum. Washed out thick pus.

Transilluminattion: Distinctly dull on right side.

Radiograph: Very distinctly shown to be ethmoidal, and antral trouble in the density of the structure. The frontal appears clear.

Eye examination showed dilated pupil; paralysis of the sphincter pupillae. No fundus lesion. Vision 20/50, and does not improve.

Diagnosis—Unilateral atrophic rhinitis, associated with unilateral sinus disease.

Treatment—Complete exenteration of the antrum, ethmoid and sphenoid on right side, with the happy result of absolute relief from the headaches; the discharge and crusts less; the odor markedly diminished, and the bleeding, which, by the way, required post-nasal packing on several occasions, has entirely ceased.

Remarks.—This case would certainly prove that sinus disease can and does cause atrophy. The second case is almost the same ,except that the radiograph is confusing, and shows, if anything, trouble on the healthy side. I am of the opinion, however, that the fault lies in the technic.

GROUP V.—THREE CASES.

Case I.—Mr. B., aged 43, laborer, single. Denies all specific history, and says he has been fairly well, with the exception of nasal and throat catarrh. Has considerable headache. Cannot see well, and has been cross-eyed for some time—about fifteen years. For the past two years has had much trouble with his throat, being compelled to cough up small, dry pieces, which require great effort. His throat and nose feel very dry at all times. Every winter, if he is exposed the least bit, he has a severe bronchitis, and once he had a pleuro-pneumonia . The crusts are not so marked of late as they formerly were. Hears poorly, and has head noises.

Status—Fairly well nourished man, whose lungs and heart are negative. Also urine and blood examinations negative.

Nasal Cavities—Double atrophy of inferior and middle turbinates. The mucous membrane of the naso-pharynx and larynx appears atrophied. The vocal cords and below them in the ventricle, and even lower into the trachea, can be seen small, dirty-looking crusts. Both tympanic membranes are markedly retracted.

Transillumination: Fairly good light through the pupils.

Radiograph: All sinuses cloudy.

Puncture of antrum negative on washing out.

Diagnosis—Double atrophic rhinitis, pharyngitis and laryngitis, and tracheitis. Otitis media catarrhalis chronica.

Treatment—Bier's constricting band about the neck, low down, worn twenty-two hours out of twenty-four, and Rethi's method of compressing the veins in the posterior choanae by holding a perforated rubber plug in this position for twenty-four hours, changing from right to left each day.

Remarks—The other two cases are of the same character, and are treated in the same manner. The time is too short to say much about the results, as the patient has only been under treatment for about three months. However, without hesitation, I can say that the symptoms of dryness are markedly lessened, and the general appearance of the mucous membrane is certainly of a healthier character.

GROUP VI.—FOUR CASES.

Case I.—Mrs. E., 35 years old, married; six children. Has for years been troubled with a dry nose and throat, and foul-smelling crusts are discharged after a great deal of effort, and

soaking in salt water. The ears are very frequently stuffed after this sort of treatment. Family, childhood and adult history negative, except that she has always been very nervous.

Examination, generally, showed nothing of importance, pathologically.

Nasal fossae: Atrophy of both inferior turbinates. The upper parts of nose are covered with small crusts and a very tenacious secretion. Pharynx is dry and glossy. Tympanic membrane retracted. Hearing reduced to about one-half.

Radiographs show cloudy sinuses.

Treatment—Exclusively daily application of the high frequency current to the nasal and pharyngeal mucous membrane. The method of applying is as follows: A resonator is used for the production of the high frequency current, being supplied by an eighteen inch coil. A glass electrode extends from the resonator, which is introduced into the nose or throat, as the case may be. After the electrode is introduced, the current is turned on and is permitted to remain at first one minute, and gradually increased to three minutes. The strength of the current is also graduated, at first light (second or third ring of the resonator), and gradually raised to the third or fourth. This treatment is carried on daily until a reaction results, something like a coryza. Then stop and wait until all irritation disappears, when the treatment is renewed, and at this time more toleration exists. It is kept up every day for one to two weeks, and then gradually every other day, etc. No other treatment is associated with it.

Remarks—All the four cases were of about the same nature, and treated in the same manner. More than two years have passed since the first case was treated by this method, and I am sure that the condition was very much improved. You understand, that these are cases on which I either did not want to operate, or was not permitted to do so.

There is another diagnostico-therapeutic experiment that I should like to report in connection with this subject namely, the use of dionin. I do not intend to go into the details of the chemistry of this substance, only saying that it is a morphin derivative. It is a sedative, but when applied to the conjunctiva, causes an artificial edema of varying degree. It is used in ophthalmology very extensively as a therapeutic agent to clear up acute as well as chronic inflammatory products. I have, therefore, argued from analogy that if it acted

in other parts of the body as it does in the eye, it would be of benefit in atrophic rhinitis; first, by causing edema, it would show whether the connective tissue is very firmly adherent to the bone or not; and, secondly, acting as it does on the eye, it would assist in absorption of chronic inflammatory products.

I have tried it on almost all the cases, and on some normal and other conditions, with such variable results that I shall be satisfied at this time simply to put the experiment on record, and say that it acts on certain individuals and not on others. It is a toxic substance, and should be used with care, although I have never had the least trouble from its toxicity, even when injecting it into the middle ear through the tympani membrane.

CONCLUSIONS.

1. That the sinuses are very frequently involved in atrophic rhinitis; whether primarily or secondarily is not always possible to determine.

2. That when the sinuses are involved the atrophy must have some other cause, as, for instance, bacteria, heredity, etc., for we find so many sinus troubles with hypertrophy.

3. That radiographs are an aid in diagnosis, and should be practiced by every rhinologist.

4. That treatment directed to the sinuses is followed by improvement, much more readily than when they are not treated.

5. That surgical intervention, preferably intranasal, gives the best results.

6. That the results of local treatment, as by tamponing, massage, electricity, vapor therapy, paraffin injection, Bier's treatment, etc., are brought about by the production of hyperemia and leucocytosis, bringing about an alterating condition, and possibly a resolution or restitution of glandular structures, normal mucous membrane and even some of the erectile tissue.

92 State St.

XXVI.

A STUDY OF EAR SYMPTOMS IN ARTERIOSCLEROSIS WITH SPECIAL REFERENCE TO THE LABYRINTH.

By John J. Kyle, *M. D.*

Indianapolis.

For a number of years, we have firmly believed that the early and late ear symptoms, as observed in general arteriosclerosis, are worthy of greater consideration, not alone as disagreeable complications of this growing disorder, but as early and important symptoms in the diagnosis of the disease. My conclusions have been verified upon those suffering from arteriosclerosis in both middle life and old age. Since having our attention directed in this channel by experience and also by the contributions on the subject by Alexander[1] in 1902, an instructive monograph, entitled, "Arteriosclerosis of the Labyrinth and Nerve Centers," by E. Escat[2] of Toulon, has appeared.

Otologic literature is singularly quite barren in regard to the ear symptoms in arteriosclerosis. I can accentuate an opinion quite freely expressed and believed, that many ear symptoms, too often considered as purely local, are the local expression of a general disease. Therefore, a tinnitus and slight deafness, with slight loss of bone conduction, may be of far deeper significance than simply disease of the perceiving apparatus, and for this reason, we should go deeply into the etiology of slight deafness, possibly thereby blocking the march of a general disease, which may ultimately harass, if not annihilate the individual.

Progressive loss of bone conduction in individuals of advanced years, has heretofore usually been considered as being due to structural change in the bone, that is, a sclerosis, the result of age. I cannot but believe that this is advisedly speaking somewhat fallacious, and that the loss of bone conduction is primarily due to change in the blood vessel walls, and secondarily, to a nutritive change in the temporal bone from faulty blood supply.

We frequently find bone conduction normal in people of advanced age who are free from arteriosclerosis. However, in forty consecutive cases with typical pipe-stem arteries, varying in age from sixty-two to one hundred years, inmates of the National Home for Disabled Volunteer Soldiers, Marion, Indiana, loss of bone conduction was present in every case. The general average bone conduction, T. C. 512, normally heard for twenty seconds was seven seconds in the right ear and eight seconds in the left.

To make myself perfectly clear in the beginning, we do not propose to consider arteriosclerosis as an accompanying condition of old age, as in the class mentioned, but confine our remarks to the disease as observed in the productive stage of life, that is, in individuals ranging in age from thirty to fifty years.

The youngest case of arteriosclerosis examined showing loss of bone conduction, was aged twenty years. The diagnosis of general arteriosclerosis was made by Dr. Wynn, of Indianapolis.

The theory of sound conduction is quite thoroughly discussed by Boenninghaus, (*Archives of Otology*, October, 1906[2]) The transmission of sound waves through the conducting apparatus, especially by mass or molecular movements, is interfered with if there is a sclerosis of the arteries of the temporal bone. The hardened arteries cannot take on a similar and simultaneous movement with the surrounding bony structures and in consequence, the movement is retarded and bone conduction is thus correspondingly diminished. There is also a coincident faulty metabolism of all the bony structures, corresponding to the amount of disturbance in the arteries of the temporal bone and middle ear. The perceiving apparatus may undergo a similar and probably earlier degeneration contemporaneous with the arterial change in the basilar artery, which will be explained in a consideration of the pathology of the subject. The intensity of air and bone conduction depends primarily upon the density of the bony structures, which is controlled by the blood supply, and secondarily upon the perceiving apparatus.

For a better understanding of the relationship between the ramifications of the arterial blood supply and the auditory nerve in its peripheral and central endings, it is necessary first to refer briefly to the anatomy of the nerve.

The auditory nerve takes its origin in the bipolar ganglionic cells within the internal ear, joins the brain at the lower border of the pons varolii, and subdivides into two parts, the vestibular and the cochlear nerves, which envelope the restiform body. The cochlear nerve, which is the true nerve of hearing, sends its fibers to the lateral cochlear nucleus and to the ventral cochlear nucleus, a ganglion in close relationship to the restiform body. Fibers from the ventral cochlear nucleus pass to the periphery and terminate in the gray cortex of the superior convolution of the temporal lobe, supposedly in the middle of the first temporo-sphenoidal convolution. In this region, posterior to the perceptive center of hearing, is also situated the center for auditory images. The anterior part of this center, according to Alt,quoted by Escat, responds to high pitched tones, and the posterior to low pitched tones. Fibers from the lateral cochlear nucleus pass parallel to the fibers of the ventral cochlear nucleus and end in the corpora-quadrigemina. According to Gowers[4], certain fibers decussate about the nuclei and pass from each ear to the opposite hemisphere, thus a disease of these centers may produce a transient deafness in the opposite ear.

The vestibular branch, the nerve of equilibration, passes into the superior vermis of the cerebellum, ending in the nuclei of Deiters, and, according to Cunningham, also in certain sensory nuclei of other cranial nerves, as the lingual, vagus and glosso-pharyngeal.

The artery supply of the labyrinth has been very thoroughly described and illustrated by Siebenmann, Politzer and Shambaugh[9]. The labyrinthine artery, the single artery of the labyrinth, is a branch of the basilar artery and is a part of the central brain system, susceptible to the same pathologic changes as observed, for illustration, in the arteria centralis retinae. Branches are given off to the cochlea, vestibule and semicircular canals. Delicate convolutions of the arteries supply the scala tympani, the scala vestibuli and the cochlear spiral, as well as the macula acustica utriculi and saculi and the semicircular canals, and are thus in minute relation to the auditory nerve and its entire subdivision, the convolutions of the veins and their convergence into one large vein, the vena canaliculi cochlearis, resembling thus, the artery.

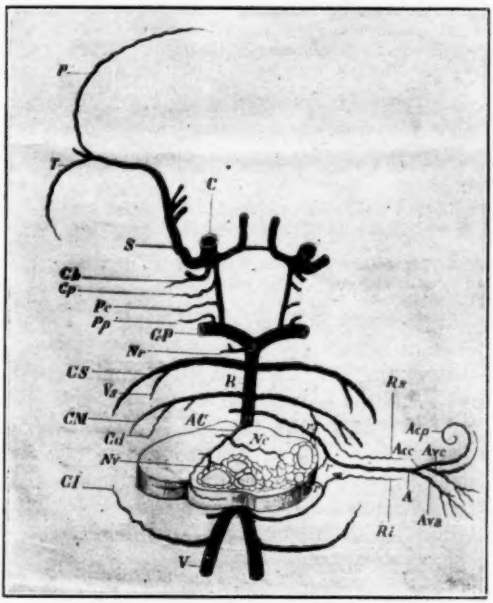


Fig. I.

P—Branch of the sylvian artery supplying the ascending parietal convolution, in which is the center of conscious equilibration.

T—Temporal branch of the sylvian artery, which is the nutritive artery of the temporo-sphenoidal convolution, the center of auditory perception and auditory images.

Ch—Branch of the communicating posterior.

Cp—Anterior choroid.

(Both Ch and Cp traverse the posterior arm of the internal capsule, through which pass the acustic tracts.)

Pc—Branch of the posterior communicating.

Pp—Branch of the posterior cerebral.

(Both Pc and Pp supply the cerebral peduncle, by which pass the bulbo-cerebello-cerebral labyrinthine tracts.)

Nr—The central artery, of which a collateral branch furnishes a terminal artery to the red nucleus, which is a relay of the cerebello-cortical paths.

CS—The superior cerebellar artery.

CM—The middle cerebellar artery.

CI—The inferior cerebellar artery.

Vs—Branch of the superior cerebellar artery, which is the principal supply to the superior vermis, in which is the center of reflex equilibration.

Cd—Branch of the middle cerebellar artery, which supplies the dentated body, in which is the center of reflex equilibration.

AC—Central artery of the medullar group, supplying the principal medullar centers of hearing.
Nc—Branch to the cochlear nuclei.
Nv—Branch to the vestibular nuclei.
Rs—The superior radical artery of the auditory and facial nerves. (The nutritive artery of the auditory trunk.)
Ri—Radical auditory artery. (Nutritive of the auditory trunk.)
rrr—Bulbar branches of the radical artery and the internal auditory.
A—The internal auditory artery (nutritive artery of the labyrinth).
Acc—The common cochlear artery (of Siebenmann).
Ava—Interior vestibular artery (nutritive artery of the vestibule).
Avc—Vestibulo-cochlear artery (nutrient artery of the inferior spiral of the cochlear and of the vestibule).
Acp—The proper cochlear artery (nutritive of the two superior spirals of the cochlea).

According to the investigations of Shambaugh, no blood vessels were found by him in the organ of Corti. Blood vessels appear, however, in the connective tissue supporting the membrana basilaris. The basilar membrane is supposed by Boenninghaus to vibrate by molecular movements communicated to the labyrinth waters by the stapes, and its function is probably controlled by the increased or diminished blood supply to the supporting connective tissue.

Escat has given us a careful description of the cerebral blood supply and its intimate relation and influence upon the aural centers and the labyrinthine terminal nerve fibers. A close study of Figure 1 will show the possibility of functional and organic change in the different centers from circulatory disturbances.

The classical causes of arteriosclerosis are syphilis, laborious occupation, alcoholism, lead poisoning, infectious fevers, autointoxication, vaso-motor disease from central disturbances, heredity and lack of balance of ductless gland secretion.

It is unnecessary for the elucidation of the subject for me to do other than refer to the subject of interstitial myocarditis and valvular insufficiency as sequential or secondary to arteriosclerosis, other than to express the theory accepted by most writers, that fibrous myocarditis is but one of the expressions of a general or local arteriosclerosis.

Heredity is recognized as an important factor in the etiology of arteriosclerosis. The same rule may be applied to arterial change as to hereditary influence in catarrhal deafness as referred to first by Von Troeltsch, and to otosclerosis by Siebenmann, Dencker, Bezold and Koerner.

Arteriosclerosis may be local or general in character and thus a sclerotic change in the arteries may be limited to the ear alone, and be unilateral or bilateral in character.

In the writer's experience, syphilis is a very frequent cause of labyrinthine deafness. We are sometimes prone to believe that sudden loss of hearing, especially with partial loss of bone conduction, is due to some condition resembling Meniere's disease, rather than to disease of the labyrinthine artery. Syphilis more often brings about a primary change in the vessel walls, and the change may be endarteritis obliterans, arteritis, and fibrous degeneration of the wall. The fibrous deposits in the walls of the arteries were regarded by Thoma as nature's method of repair following degeneration of the muscular tissue of the artery. In deafness from syphilis, we also frequently find present a beginning general arteriosclerosis and mild interstitial myocarditis. The deafness may be entirely confined to one side. In general arteriosclerosis from age, deafness is usually bilateral. Typhoid fever and many infectious diseases are followed by circulatory disturbances, sametimes for many months, and if the patient is not carefully guarded against these conditions which might retard repair, local or general change in the arteries and veins may occur, very obscure at first, and very insidious.

Pearce and Stanton[6] (*Journal of Experimental Medicine*, 1906), demonstrated on rabbits that a selerotic area in the aorta and aneurismal bulgings, due to degenerative changes and calcareous deposits in the muscular fibers of the media, resulted from the injection of 1 to 1-1000 solution of adrenalin every other day. If these results hold good in man, it stands to reason that the promiscuous and continued use of adrenalin in nasal irritations, and the continued use of the drug hypodermatically for the relief of asthmatic conditions, should be discouraged somewhat until our knowledge of the subject has been more thoroughly defined.

The pathology of general arteriosclerosis is well understood and a brief reference to the changes observed may be all that is necessary. The affection probably begins as a structural change in the vasa vasorum, and is fibrous in character. In consequence of this, the nourishment of the artery wall is disturbed and connective tissue degeneration takes place in the media. Fatty degeneration soon follows in the intima with the formation of deposits of calcareous salts. The vessel wall is narrowed and sometimes obliterated.

The pathologic change noted in the labyrinth is of more special interest. The same general rule of change takes place in the labyrinthine artery and its branches as in the larger arteries. The terminal arteries in the labyrinth are so small that any structural change is quickly manifest in the nerve structures. As soon as the nutrition of the basilar membrane and organ of Corti is partially or completely cut off, there is an atrophy of the sensory auditory cells and connective tissue proliferation of all the structures. The same change may be

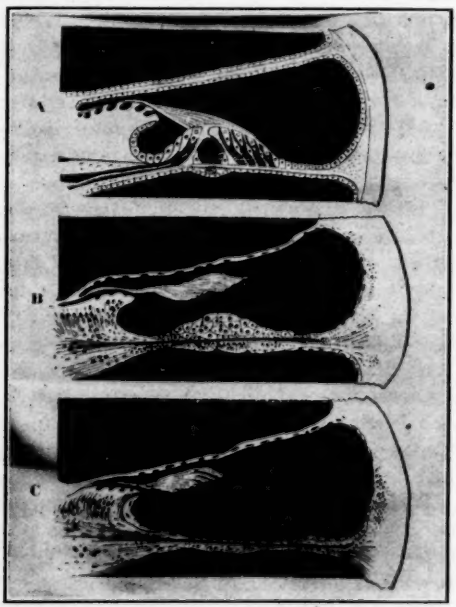


Fig. II.

Schematic Drawing, Showing the Normal Organ of Corti in Comparison with the Organ of Corti in Arteriosclerosis. (After Alexander and Escat.)

observed in the nerve endings of the vestibulae and semicircular canals.

A study of the schematic drawings in Figure II, taken from Alexander and Escat, will give the reader a clear conception of the change in the cochlea. Figure A represents the normal organ of Corti. In Figure B, there is shown a complete atro-

phy of the cells of Claudius and Deiter, and the epithelial cells of Reissner's membrane.

The cells of the organ of Corti have undergone connective tissue proliferation, with closure of the tunnel of Corti and disappearance of the vas spirale. In Figure C, there is represented the last stage of the destructive process as described by Alexander, that is, absorption of the nerve elements and connective tissue deposits.

The change in the brain structures from arteriosclerosis may vary according to the amount of nutrition carried to the parts. In endarteritis obliterans in the vessels to the center of hearing and equilibration, there is, on account of the slow change in the artery wall, degeneration and atrophy of the brain cells. The same morphologic change takes place when the blood supply is partially destroyed. In hemorrhage extravasation from rupture of the atheromatous blood vessels, there is death of the cells. Thus alteration in the center for audition and conscious equilibration, or equilibration, must vary according to the blood supply and inherent vitality of the cells.

The general symptoms of arteriosclerosis are increased arterial tension, increased tortuosity and prominence of the arteries of the temple, hypertrophy of the heart, and if the last is present, there is generally a lowered vitality of the individual, a sensation of age, and tiring, as from overwork, followed by an appearance of premature aging. In interstitial myocarditis, associated with sclerosis of the coronaries, the pulse may be extremely weak and irregular, and the apex beat of the heart very strong; in other cases, the pulse may be full and the heart beat loud and displaced to the left. According to Osler, in addition, "The combination of heightened blood pressure, a palpable thickening of the arteries, hypertrophy of the left ventricle and accentuation of the aortic heart sound, are signs pathognomonic of arteriosclerosis."

Analysis of the urine usually shows increase of the urates and long, thin, hyalin casts, undergoing granular degeneration. Other kidney changes will become manifest in arteriosclerosis of the kidney, as albumin, uric acid and calcium oxalate crystals. Many other symptoms could be enumerated. For further information, the reader is referred to the contributions by Stengel[8] on the subject of myocardial disease.

The ear symptoms which should direct our attention to a local or general circulatory disturbance, are unilateral or bi-

lateral tinnitus, slight and progressive deafness, loss of air and bone conduction, dizziness sometimes early in the disease and in the later stages of the disease, sometimes hallucinations of hearing. The ear symptoms necessarily vary according to the extent of the sclerosis. It is well known that in severe hemorrhage or progressive anemia, deafness and tinnitus may occur. If the hemorrhage and anemia are severe and prolonged, deafness may be permanent, being due to an obliteration of some of the blood vessels of the cochlea or the special cochlea center in the brain. A passive tinnitus or a passive dizziness is probably due to a circulatory disturbance in the arteries of the semicircular canal or special centers of equilibration. These conditions are frequently attributed to liver disorder, rather than a valuable symptom of a possibly beginning general arteriosclerosis. A deafness without dizziness, tinnitus, or Meniere's syndromes (providing no mechanical cause of deafness exists), with some general symptoms of arteriosclerosis, is indicative of thickening in vessels to the nucleus, and if associated with peripheral paralysis, may be indicative of disease of the internal capsule. Loss of hearing with dizziness may be due to a vascular disorder from tumors in the cerebrum, cerebellum or pons varolli, as well as to a sclerosis of the labyrinthine artery. Loss of hearing and dizziness, continuing for a long time, are valuable signs of vascular disturbance in the entire encephalon. If the eye symptoms are also present, the evidence is complete.

A beginning sclerosis of the vertebral artery may press upon and irritate the cervical sympathetic fibers which send fibers to the labyrinth, supposedly through the non-medullated cells of Remak, found by Erlitzki in the auditory nerve (Bonnier), probably producing a tinnitus or dizziness long before the sclerosis has extended to the arteries of the labyrinth.

Escat calls attention to the sympathetic system and its influence, especially in the production of the serous effusion in Meniere's disease, which may take place in the labyrinth, from a sudden irritation in the vaso-dilator fibers or paralysis of the vaso-constrictors. It must be conceded that any molecular change in the blood vessel wall, as described by Cohnheim, from intrinsic or extrinsic causes, predisposes to Meniere's disease.

The diagnosis of local or general arterisclerosis depends upon the symptoms enumerated above. The essential point to be accentuated in this paper, is the early symptoms of arterio-

sclerosis as manifested in the ear, that is, tinnitus, vertigo, nutritive change in the membrana tympani, and the necessity for a careful general examination of such cases. The diagnosis of faulty nerve perception, with the modern tuning fork, is easy. The location of the lesion in the nuclear or peripheral endings of the nerve, is somewhat difficult, however, Gradenigo[5] has quite well established the theory that there is diminution in the bone conduction for highest tones in peripheral nerve deafness, whereas in central deafness, there is not as pronounced loss of perception for high tones as for low ones. In both central and peripheral deafness of slight or pronounced degree, it is reasonable to presume a corresponding loss of bone conduction for all tones. Before making the above differential test, it is necessary to exclude any disease of the conducting apparatus. In disease of the conducting apparatus and nerve deafness, the test for central deafness is difficult.

In a late case of aphasia under observation, there was a diminution in low tones on the left side, as well as high tones, a further proof of the theory of Gradenigo.

The disease shou'd not be confounded with Meniere's disease, which is a condition sudden in its onset, though probably often due to primary arteriosclerosis, hyperemia of the auditory nerve from ingestion of certain drugs, hysterical deafness, or nerve deafness from toxic absorption, as is sometimes observed in parotiditis, or hemorrhagic extravasation into the labyrinth, from a fall or blow upon the head.

For want of time and space, the middle ear symptoms will not be considered, other than to call attention to the diagnostic value of the presence of the arcus senilis of the tympanic membrane, present in so many cases of general arteriosclerosis.

In a general sense, the prognosis depends upon the extent of the sclerosis, that is, whether or not it is general or local in character, and the degree of arterial change.

If habit, occupation or disease affecting the trophic and vaso-motor systems can be controlled etiologically before the disease is far advanced, the prognosis may be favorable. Those cases due to syphilis which are discovered early, before degeneration has taken place in the blood vessels and nerve of audition, in which the disease is purely functional rather than organic, the prognosis under treatment is favorable.

When the cells of the basilar membrane or of the organ of Corti are once destroyed, they cannot be restored. It is unfortunately impossible to prognosticate this condition for the reason that heretofore too little attention has been given to the affection by the otologist. These cases have drifted to the general medicine man, who has more often ignored the ear symptoms and given them no recognition in the diagnosis of general disorders.

I believe it is just as essential for the neurologist to study aural symptoms as eye symptoms in brain disease. The ear is as much an off-shoot of the encephalon as the eye.

There are also certain aural symptoms when taken separately or collectively, that may enable us to tell, satisfactorily, something of the cure or relief of the deafness, dizziness or tinnitus. As to the value of many of the symptoms in prognosis, I am indebted to the illuminating remarks of Escat.

If tests of hearing show slight nerve or central deafness rather than labyrinthine deafness, the prognosis is more favorable. Involvement of the centers of equilibration may respond to treatment. Prognosis in Meniere's symdromes, due to arterial change, is dependent upon the amount of destruction in the artery to the semicircular canal, and if slight, prognosis is favorable, whereas if severe, the prognosis is unfavorable.

Persistent dizziness, with slow pulse, respiratory disturbances and paralysis, is a grave symptom. The prognosis is unfavorable in continued deafness with Meniere's symdromes. When vertigo and deafness are transient and variable in character, the lesion is probably in the center of equilibration, and the prognosis is favorable.

With the establishment of complete labyrinthine deafness, accompanying tinnitus may suddenly disappear. A lesion in the center of equilibration, due to arterial change or arteritis obliterans, may possibly be relieved in time by compensatory circulation.

That the syndrome is intimately associated with change in the walls of the central blood vessels is emphasized by the frequency with which these symptoms precede hemorrhage into the internal capsule and their frequency in the chronic form of meningitis, so that when associated with increase of blood pressure, tinnitus, vertigo and impairment of hearing have become recognized as of extreme importance in the foreshadowing of the graver intracranial disaster.

The treatment of arteriosclerosis of the ear is both general and local, depending somewhat upon the exciting cause. Those cases with hereditary influences as predisposing factors, do not respond to treatment as do those with syphilis or acquired causes. However, in both conditions, the iodid of potassium, in from two to five grains, four or five times daily for long periods of time, is indicated.

H. Richardson[7] recommends glycocholate of sodium, in five grain doses, in arteriosclerosis from any cause.

Where the heart is able to withstand the shock, hot baths are indicated. Too much exercise is contraindicated in any stage of the disease, and rest is more essential than exercise.

The diet should be carefully regulated. The patient should consume only a moderate amount of meat, no alcoholic liquors, and very little tea, coffee, or tobacco. A moderate amount of water should be taken, the excessive use of water being discouraged.

The question of the effort to control the high blood pressure, observed in some cases, due to the presence of toxines, must be governed by the etiology in each separate case. In the nephritic cases, high pressure is supposed to be beneficial whereas in cases of angina pectoris, apoplectic or Meniere's syndromes, those drugs considered vaso-dilator may be beneficial.

The local treatment consists in inflation of the middle ear twice or three times weekly, through the Eustachian catheter with superheated air, for the stimulating effect of the air, and external massage. If there is a suspected sclerosis of the blood vessels of the Eustachian tube and middle ear, the treatment differs but little from that for dry catarrh.

226-229 Newton-Claypool Building.

BIBLIOGRAPHY.

1. Alexander, Archives für Ohrenheilkunde, August, 1902.
2. Boenninghaus, Archives of Otology, October, 1906.
3. Escat, Arterio-sclerose en Labyrinthe et des Centres Acustiques.
4. Gowers, Diseases of the Nervous System.
5. Gradenigo, Handbuch der Ohrenheilk. Vol. II.
6. Pearce & Stanton, Experimental Medicine, 1906.
7. Richardson, New York Medical Journal, Sept. 30, 1906.
8. Stengel, Arteriosclerosis as a General Disease, Medicine, June, 1906.
9. Shambaugh, Blood Vessels in the Labyrinth of the Ear.

XXVII.

HYPERTROPHY OF THE PHARYNGEAL LYMPHATIC RING AS A CAUSATIVE FACTOR IN THE PRODUCTION OF EPILEPTIC EQUIVALENTS.

By Walter S. Daly, M. D.,

Ogdensburg, N. Y.

As far back as history shows and tradition indicates, epilepsy has afflicted man. Methods without number, drugs beyond estimate, have been employed for its cure. Yet epilepsy is ever with us, and still no specific has so far been found. In view of this fact, the great importance of preventing epilepsy becomes apparent, and to prevent it in one group of persons we must be able to recognize a tendency before it eventuates in a habit, and in another realize the enormous importance of certain peripheral irritations as a cause.

A child of neurotic heredity is especially prone to motor nerve storms, and the first indication of an epileptic tendency is often an attack of infantile convulsions. It is not assumed that such an outbreak invariably precedes epilepsy, but it is unquestionably the fact that a large majority of epileptics of whom an accurate history is obtainable, have had these convulsions in infancy.

Furthermore, epilepsy, from the viewpoint of modern neurology, is not necessarily characterized by convulsions, for, it is an indisputable fact that an attack of epilepsy may occur without a convulsive seizure, the convulsion being substituted by certain mental disturbances called epileptic equivalents.

Such attacks in childhood exhibit a morbid sensibility to peripheral irritations, and should be esteemed a peremptory indication for years of watchful care, our aim being to prevent the occurrence of other convulsive seizures and the formation of a habit of convulsion or epilepsy.

An epileptic equivalent, therefore, is a certain state of consciousness differing not only from normal consciousness, but from the state of consciousness that usually occurs in epileptic attacks. The term really signifies a psychical state that in some degree takes the place of an epileptic seizure.

These phenomena present many points of interest, are of rarer occurence than true epilepsy and are more difficult to diagnose.

Case:

Harry P., aged 10, was a farmer lad, whose family history was negative, and whose relatives on both sides were long lived and healthy.

Personal History.—Patient developed naturally as a baby, but at the age of two years had what was called a "worm fit," which came on quite suddenly with nausea and vomiting, followed by an attack of what was undoubtedly a seizure of the grand mal type of epilepsy, presenting the classical symptoms, general tonic and clonic spasms, cyanosis and loss of consciousness.

Following the attack, which lasted five minutes, the patient urinated very freely. During the next three years the child averaged about three of these attacks a year; the attacks, however, gradually increased in severity and duration. At the age of five the attacks suddenly ceased, to be followed by a period of quiescence, lasting five years, during which, the boy, to all appearances, acted like other boys, was very quick to learn, and showed no abnormal traits.

Suddenly, during the night of February 18, 1906, the patient was taken with a spell, during which he complained of being afraid, wanted to leave the house, cried out spasmodically, putting his hand to the right side of his head, as if his ear, on that side, were aching. When the pain was at its height, the boy appeared dazed and aimlessly moved about the house. This spell of insane manifestations lasted nine days, then gradually subsided, and for a period of two weeks the boy was, apparently, as well as ever.

He then had a second attack which came on suddenly while in the barn helping his father remove a calf from one stall to another. The first thing noticed was that he began asking his father where his calf was; he apparently did not comprehend his surroundings and had forgotten what he had been doing just a few minutes before. With expression vacant, and ideas confused, he wandered from one person to another, finding nothing to please him, nothing to pacify him.

Shortly afterwards, he complained of pain, now in the left side of his head, and frequently cried out: "Oh, my ear." This condition lasted for a period of seven days and then ended

abruptly, when the patient cried out: "There, it has gone." After three or four days of sluggish mentality, he gradually brightened up and appeared well for about two weeks, at which time he was visiting his aunt, who noticed, about the noon hour, that he began to talk strangely, to sing, and to fear being left alone. At two o'clock he complained of severe pain in both sides of the head accompanied by the usual insane manifestations of the previous attacks.

The attack lasted nine days, gradually subsiding in three or four days, to be followed by a fourth attack two weeks later.

The fourth attack suddenly began about nine o'clock in the morning, when the boy rushed out into the road and, looking up the hill nearby, began calling: "Hello, Frank," and shook his hand over his head. There was no one in sight—evidently hallucinations of vision. In a few hours pain in the head supervened, and he appeared dazed and confused. He did not seem to recognize the presence of his parents, even though they were by his side; would frequently call his mother, even while she was trying to quiet him. Evidently illusions of identity.

During all these attacks, there was entire oblivion on the part of the patient of all that had happened.

It was during this last attack, and on account of some possible mastoid implication, that the writer first saw the case with Dr. George Young, of Prescott, Ontario, the family physician, to whom I am indebted for much of the early history. On my arrival at the house, the boy, crazed and delirious, ran away, and it was with difficulty that he was apprehended. A thorough examination was impossible; so, the parents were advised to bring the boy to my office when a lucid interval would occur, which I had every reason to believe would come in about ten days.

About two weeks afterwards, on June second, he was given a thorough examination with the following findings: The patient is a well developed boy of ten years, light complexion, light hair, lips slightly thickened and gaping, mouth breather, with a lack of resonance of the voice, obliteration of the normal lines of expressions of the face, pupils moderately and equally dilated, the special senses normal and unimpaired, nothing abnormal about the ears or mastoids, a coarse tremor of the tongue and fingers, the other parts of the body being steady. The patient has control of the various muscles of the body, showing good strength; nothing abnormal was

found in the chest and urinary organs; temperature and pulse normal, the roof of mouth is narrow and highly arched. Examination of the throat showed marked hypertrophy of the pharyngeal lymphatic ring. Finding nothing, beyond an hypertrophy of the tonsillar ring, to account in a causative way for the several attacks of which the boy had been the victim during the past four months, I called in consultation, Dr. R. H. Hutchings, Psychiater and Superintendent of St. Lawrence State Hospital at Ogdensburg, N. Y., who, after careful inquiry, diagnosed the attacks as epileptic equivalents. It was brought out that these epileptic manifestations, in a boy epileptically inclined, might be produced by some peripheral irritation, such as, in this case, hypertrophy of the pharyngeal lymphatic ring.

So, accordingly, on June fourth, I removed the hypertrophied condition of the tonsillar ring, with the result that all the epileptic manifestations have disappeared and have remained so to the present day.

In view of the striking results here obtained, it must be concluded that this case of epileptic equivalent was either wholly or largely due to the irritation in connection with the hypertrophied tonsillar ring. As would be expected, his mental condition has also improved very much since the removal of this peripheral irritation.

The case, from early childhood, was evidently one of epilepsy, the manifestations of which were caused by some peripheral irritation, which, if removed, would, in all probability, safeguard the child against future and more serious attacks.

Any irritation, whether it be in the alimentary canal, worms, carious teeth, stomach affections; in the respiratory organs, polypi, adenoids, tonsillar hypertrophies; or in the eye, ear or sexual organs may precipitate an explosion in a patient epileptically inclined. It is probable that the peripheral irritation in some way interferes with or disturbs the circulation of blood through the brain. There seems to be first a spasm of the cerebral arteries, causing a profound anemia of the brain, and later a dilatation of the cerebral vessels causing a congestion or hyperemia of the brain.

Up to within a few years, because the symptom-complex of certain types of minor epilepsy occurring in early childhood did not bring out prominently those classic symptoms of epilepsy, tonic or clonic convulsions with loss of consciousness,

the medical profession has passed them by, entirely overlooking and ignoring their importance and gravity. Allow incipient manifestations such as "worm-fits," "teething fits," "stomach fits," "lapses," "faints," "night horrors," "sleep walking," "absentmindedness," and other apparently innocent phenomena, which are nothing more than epileptic equivalents, to pass unnoticed and uncared for, and you may have, thoughtlessly, launched your little patient upon the full tide of epilepsy.

If there is one disease in which early recognition is desirable, it is epilepsy. The early recognition of these obscure epileptic manifestations of early life, which present themselves under so many and so diverse forms, is really a difficult problem. For unless we are constantly on the lookout for them, we are very apt to view them rather as the innocent mannerisms of childhood life than the true landmarks of a disease so full of torment for the body and so disastrous to the mind.

Epileptic equivalents in childhood commence so insidiously that they are hardly noticed at first. Look at the little child of two or three years drumming away on its plate at meal time, and, all of a sudden, stops, strikes some peculiar dazed attitude for a short time and then resumes its play with a smile. At first the parents regard these spells as cute, but when the child reaches the age of five or six, they think it is high time for the child to discard its baby cuteness; so, in the effort to correct these hitherto cute, but now, annoying ways, the parents resort to all kind of discipline and even punishment.

The convulsion tendency of a child in whose life we find such mother-named spells as "worm-fits," "teething fits," "stomach fits," "faints," "lapses," or any other convulsive manifestations of similar nature, should be a matter of solicitude to the attending physician as long as that child lives. It should be an invariable rule to search thoroughly every such individual for points of irritation. Wounds of the head or other parts of the body, astigmatism and other imperfections of the eyes, diseases or malformations of the throat and nasal cavity, carious teeth and retained milk teeth, aural disease, adherent prepuce or other irritation of the genital organs are among the irritations which have in very many cases provoked epileptic manifestations.

The importance of thorough examination is increased by the fact that the reflex epilepsy may engender the epileptic habit.

Even with the passing of infancy there still remain certain critical periods such as the first and second dentition and at puberty, during which that same convulsive tendency of former days must be guarded against. Epilepsy, in its development, occurs with greatest frequency between the ages of ten and sixteen.

"The keynote to the whole situation," as Sprattling says in his article on "Unrecognized Epilepsy," "is in mistaking apparently innocent phenomena for phenomena of the gravest import. Muscular contractions and distortions are nothing in the prognosis of epilepsy compared to the disastrous form of the disease that may be so silent in its appearance, course and termination as wholly to escape unskilled observation. We are just beginning to learn a great truth in the treatment of epilepsy, similar to the one it took us hundreds of years to learn about tuberculosis, and that is, that freedom from the disease is often but little more than a matter of right living."

It is not my intention to convey the impression that this young boy was cured of his epileptic manifestations, by the simple removal of his hypertrophied tonsillar ring, rather, that another blow at the mentality of this epileptically inclined boy was warded off. For, as it has been well said: "The convulsive tendency of an individual must be respected so long as that individual lives." But I do make a plea for the early recognition and proper treatment of epileptic equivalents, of whatever nature, as they occur in the practices of the fellows of this society, so that hand in hand with the neurologists of today, no obscure nervous disease due to a peripheral irritation whether it be in the eye, ear, nose or throat, may be allowed to pass unrecognized and uncared for.

80 State Street.

BIBLIOGRAPHY.

1. Bullette. . . . . The Laryngoscope. 1906
2. Sprattling. . . . . Jour. Am. M. A. 1906
3. Ch. Féré. . . . . La courbature comme Equivalent Epileptique, Revue de medicine. 1903
4. Bianchini. . . . . Revue Neurologique. 1904
5. Janet. . . . . Boston Med. & Sur. Jour. . . 1905
6. Fletcher. . . . . Med. & Surg. Monitor. . . . 1903
7. Gomers. . . . . British Med. Jour. 1906
8. Ingbert. . . . . The Alienist & Neurologist. 1906

9.	Turner	Lancet (London)	1905
10.	Ashley	Lancet (London)	1905
11.	Shirres	Vermont Med. Monthly	1905
12.	Tuke	Psychological Medicine, Vol. II.	
13.	Gordon	Jour. Am. Med. Assn	1907

XXVIII.

EPITHELIOMA OF THE LARYNX; TOTAL LARYNGECTOMY INCLUDING THE REMOVAL OF PART OF THE TRACHEA. DEATH FROM PNEUMONIA ON THE THIRTEENTH DAY*.

By Clement F. Theisen, M. D.,

Albany, N. Y.

This case is reported, because it emphasizes the point brought out by Delavan in a paper read at a meeting of this Association (Recent Advances in the Treatment of Malignant Disease of the Larynx. 1904), that *early* radical operation offers the only reliable prospect of cure in cancer of the larynx. It brings out another point, so often raised by Mackenzie in discussions upon this subject, that microscopic diagnosis of cancer of the larynx is often difficult, and that the laryngologist may be misled by his pathologist, and valuable time lost.

There is no doubt, however, that the fault is often the laryngologist's, because he does not cut deeply enough into the growth when he removes a piece for microscopic diagnosis. It is well known that a laryngeal growth may not show malignancy on the surface, and still be malignant. This question has been so thoroughly discussed at meetings of this association that I will not go into it any further. I will say, however, that in my own case, it would have been better, and the patient would have had a better chance, if the radical operation had been performed just as soon as the naked eye diagnosis of cancer was made.

I *did* make that diagnosis, but after several pieces had been removed for microscopic examination, and the report had come back that the growth was not malignant, I felt doubtful of my diagnosis, and so lost much valuable time.

I have no doubt that the removal of pieces of the growth for examination was probably responsible for the very rapid extension of the disease subsequently.

*Read at the Twenty-ninth Annual Congress of the American Laryngological Association, Washington, May, 1907.

Mr. F. M., aged 57 years, was referred to me by his physician (Dr. Barnes, of Troy), with the history, that for several months he had been hoarse, but that his general condition had been very good. I first saw him last September. On examination, the nose, nasopharynx, and pharynx, showed practically normal conditions. On laryngeal examination, however, a rather flat, somewhat nodular, firm growth, involving about two-thirds of the left vocal cord, was seen. This presented, very much, the appearance of multiple, small, papillomatous excrescences. The left ventricular band was somewhat reddened and thickened, as was also the mucous membrane in the left arytenoid region. The right cord was slightly reddened, but was smooth and otherwise normal.

On October third, several small pieces of the growth were removed with cutting forceps, and sent to the laboratory for microscopic examination.

The report came back that the growth was not malignant, and was probably of an inflammatory character. My original clinical diagnosis was carcinoma, but thinking that I must be mistaken, I talked the matter over with his physician, and we decided to use palliative measures for a time. There was no involvement of the cervical lymph nodes so far as could be determined.

The patient was under my observation for a number of weeks after this, and improved somewhat. Then I did not see him until January 14th of this year. He had been having considerable dyspnea, and was breathing with some difficulty when he came into my office. The growth had extended very much in the interval, involving the whole left cord, extending below the cords, and the right cord also showed evidence of a new growth. The condition now was so clearly malignant, and the dyspnea was so great, that I performed tracheotomy, using equal parts of a sterile solution of 1 per cent cocain and 1-10,000 adrenalin.

This solution I have used in a number of tracheotomies in adults, and it has given uniformly good satisfaction.

I told him that a radical operation still offered him some chance, but it was not until three weeks after the preliminary tracheotomy that he would consent to this. A total laryngectomy was performed in the Samaritan Hospital in Troy, and for a week the patient got on very well.

The method that has been advocated by Gluck, working from above downward, was followed. Because the growth

had extended into the upper part of the trachea, the trachea was removed with the larynx for some distance below the site of the preliminary tracheotomy, the severed trachea being stitched to the skin. Chloroform was administered through the tracheotomy tube during the operation.

The patient was given no nourishment by the mouth for several days after the operation, and for a week got along very well. He then developed a pneumonia and died on the thirteenth day after the operation.

The operation was performed in conjunction with Dr. Harvie, of Troy, attending surgeon to the hospital, and Dr. Barnes.

The pathologic report is as follows:

SAMARITAN HOSPITAL,
February 9, 1907.

Gross Description: The specimen consists of a larynx. On its anterior surface, just below the thyroid cartilage, a small portion of skin is attached, in the center of which is a sinus communicating with the trachea below the larynx, the result of a tracheotomy. The walls of the sinus are lined with granulation tissue. The inner opening into the trachea is about 1 cm. in diameter, and much larger than the surface opening. By looking into the larynx from above, a vegetative growth is found on the vocal cords, particularly on the left side, and the cords seem partially fixed. After sectioning the larynx posteriorly in the median line, the left side is found to be almost completely covered with a whitish, minutely nodular, fungoid growth, of firm consistency. The growth extends to the right side also, but involves only the anterior third of the right vocal cord. The central portion of the growth is softened, and somewhat degenerated, the advancing edges elevated and hard. No regionary metastases are found.

Anatomic Diagnosis: Epithelioma of the larynx.

Microscopic Appearance: The surface epithelium, at the margin of the growth is of normal appearance, its transition into the malignant growth can be definitely demonstrated in the sections. The growth itself is entirely of epithelial origin, and consists of irregular columns or spheres of epithelial cells, growing into the underlying tissue in all directions. The cells are cuboidal or round, of large size, with a pale staining nucleus, and many mitotic figures can be seen. The marginal cells are more closely packed, and resemble in their arrange-

ment the stratum Malpighii in the epidermis. The growth shows a tendency to rapid degeneration in the centres of the columns and spheres, for frequently the cells are replaced by granular detritus. The interstitial connective tissue is thickly infiltrated with small mononuclear leucocytes and plasma cells, and in some areas there is a proliferation of the small capillaries. The hyperplasia of the connective tissue is definite, and has the appearance, in places, of granulation tissue. No metastases could be found.

Revised diagnosis: Epithelioma of the larynx.

H. W. CAREY.

Undoubtedly, Gluck has had by far the largest experience in total laryngectomy for malignant diseases of the larynx, and has had the most successful record, considering the large number of operations he has performed.

Recently, Chevalier Jackson (*British Med. Journal*, November 24, 1906), reported eight total laryngectomies, with no operative mortality. One of the patients lived seven years after the operation, and one case lived three years without recurrence, dying of cerebral hemorrhage. One patient lived eight months, dying of alcoholism. Of the remaining five, three recurred within a year, one apparent cure was lost sight of, and one was too recent to record.

Preliminary tracheotomy seems to be advisable, although Keen, without preliminary tracheotomy, severs the trachea and stitches it to the skin as the first step, after exposing the larynx and trachea. This method of stitching the trachea to the skin was also successfully employed by Solis-Cohen in his well known case.

In conclusion, the writer would say that in his case the delay occasioned by the favorable report of the pathologist was certainly injurious to the patient. An early thyrotomy might have been performed, with a much better chance for the patient. In such doubtful cases, it would seem best to depend upon the naked eye diagnosis of cancer and go ahead with the operation immediately.

The removal of pieces of the growth for microscopical examination, is not always wise, because if only small pieces are removed from the surface of the growth, the examination may not show malignancy.

XXIX.

SARCOMA OF THE PHARYNX IN A CHILD OF EIGHT YEARS, WITH AUTOPSY FINDINGS AND MICROSCOPIC REPORT*.

By Clement F. Theisen,

Albany, N. Y.

A search of the literature of the past twelve years revealed the fact that sarcoma of the pharynx in young children is rare, so that the writer considered the following case worth placing on record.

A. S., a girl aged eight years, was referred to the writer on January 11th of this year, with the history that for several months there had been an increasing difficulty in breathing. The child's parents are living and well, and there are five other perfectly healthy children in the family. The child's great-grandfather is said to have died of cancer of the throat. The child had lost weight rapidly and was in bad general condition.

Examination of the throat showed the presence of a large mass including the soft palate, and pushing it forward. The growth extended downward almost to the epiglottis, and, apparently, into the nasopharynx, although this could not be examined, as the finger could not be carried around and back of the growth. There was a constant discharge of an offensive mucopurulent material from the left nostril.

The mass was firm to the touch, and did not show any evidence of breaking down. There was some involvement of the glands, particularly of the left side of the neck.

Dr. Elting, of Albany, a general surgeon, saw the case with me, and agreed that the tumor was inoperable. The child was admitted to the Child's Hospital on January 14th, and it was decided to try mixed toxins (erysipelas and bacillus prodigiosus, Coley's serum), following the method advised by Coley (*Journal American Med. Ass.*, March, 1906). A piece of the growth was removed for microscopic examination, and sent to the Bender Laboratory, with negative results. Here again, although a fairly large piece was removed, we

*Read at the Twenty-ninth Annual Congress of the American Laryngological Association, Washington, May, 1907.

probably did not go deeply enough to show the malignant character of the growth. Clinically, however, there was no doubt at all about its malignant nature.

The injections of the serum directly into the mass were started a few days later. We started with m. 1/3 increasing m. j. or more each time. We got no reaction until January 25th, after the injection of m. iij. into the mass. Temperature rose to 103.4° F. Pulse 136. On the following day the temperature was down to 99° F.

There was another reaction (temperature 102° F., pulse 160), after the use of m. iv. of the serum. On February 3d, a hemorrhage from the nose and throat, lasting about an hour, occurred, and was controlled with adrenalin and ice.

The amount of the serum was steadily increased, and another reaction (temperature 102.6° F., pulse 140), obtained, when m. vij were injected. Reactions were also obtained when m. xiv and xvj were used. The injections were given at first every other day and finally every day, as much as m. xx being used.

The patient breathed with difficulty during the night of March 4th, and died on the morning of March 5th. Adrenalin injections were not used in this case, because the method is slow, and the child's condition was so bad that we thought prompter results would probably be obtained with the mixed toxins. Iodid of potash had been used without any result, and had to be stopped because it greatly increased the difficulty in breathing, by producing an edema of the mucous membrane.

For a few weeks after the serum injections were started, the child appeared to improve, the breathing being easier, and the growth apparently becoming a little smaller.

On the whole, however, in this case at any rate, the use of Coley's serum did not do any good. It certainly did not produce the slightest softening of the growth. The autopsy findings were as follows:

The Bender Hygienic Laboratory.

Name, Anna S.; No. 0-1108; date, March 6, 1907.

(Dr. Robinson).

Aged 8 years; Child's Hospital. Service of Dr. Theisen.

Clinical Diagnosis.—Sarcoma of soft palate.

Body is that of a fairly well-built, poorly nourished female child, measuring 123 cm. in length. Rigor mortis absent.

Pupils unequal, the right being dilated and measuring 5 mm. in diameter; the left contracted and measuring 1.5 mm. in diameter. A ptosis of the left upper eyelid is present. The cervical lymph nodes on both sides, but especially on the left, are enlarged and readily palpable.

On exposing the abdominal cavity, the intestines are seen to be distended with gas, the appendix is bent on itself and bound to neighboring tissue by firm fibrous tags. The mesenteric lymph nodes are apparently normal; pleural cavities, normal; pericardium, normal; heart, normal; lungs, normal; liver and gall bladder, normal; spleen, normal; stomach and intestines, normal; kidneys, normal; adrenals, normal; pelvic organs, normal; aorta, normal; neck, the left lateral aspect of the neck downward from the left ear is slightly prominent, and some enlarged lymph nodes are felt. The mouth is two-thirds filled, principally on the left side, with a firm, globular growth attached more at the left side of the junction of the soft with the hard palate, which extends from there to the side of the cheek down along the side and back of the pharynx on the left, and is most intimately adherent to the left side of the pharynx, especially to the pterygoid process and as far down as the gullet. The tongue fills the lower part of the oral cavity and the growth the upper part, both meeting tangentially as two spheroids, making it appear as if the communication with the pharyngeal opening was obliterated, but the obstruction is only apparent, and a finger can be readily introduced between the tongue and tumor into the pharynx.

By incision along the oral attachments of the tumor and by loosening up the pharyngeal attachments, the trachea, larynx, esophagus and tongue can all be removed with the growth.

The tumor consists of a pinkish white, roughened, irregularly lobulated mass of tissue measuring about 7x4x4.5 cm. It involves the entire soft palate, the pillars of the fauces on both sides, the left side of the pharynx, from the pharyngeal vault downward to a level with the epiglottis, the lower and right hand portion filling in the space above the epiglottis, but being free and unattached in this part, the attachments on the left side supporting the growth.

On section, the surface is homogeneous in appearance, with no coarse connective tissue stroma, but apparently very cellular. The tissue is glistening and semi-translucent, of uniform

consistency and of an elastic nature. On a level with the upper margin of the thyroid cartilage and to the front of the lateral border of the mass above described is a smaller, but similar mass measuring 3x2.5x2.2 cm., probably a group of enlarged cervical lymph nodes.

Anatomic Diagnosis.—Sarcoma of the pharynx. Enlargement of cervical lymph nodes. Chronic periappendicitis.

Microscopic Description.—Sections through the tumor show tissue which, in most parts, is densely cellular. The cells have deeply staining, somewhat vesicular, oval or spindle shaped nuclei, with little or no intracellular substance. In places the cells are arranged in fascicles, which cross and interlace and here the structure is less dense than elsewhere. Connective tissue trabeculae penetrate in various portions, and edema of some areas is present. Blood vessels are abundant and fairly well formed. The enlarged lymph nodes in connection with the tumor do not show an invasion by the growth. A marked hyperplasia of the lymph follicles and lymphoid element exists.

Microscopic Diagnosis.—Spindle celled sarcoma with hyperplasia of neighboring lymph nodes.

J. O. ROBINSON.

The following case, reported by Halstead (Trans. Amer. Laryngol. Rhinol. and Otol. Soc., 1897), was somewhat similar to the writer's.

Emma R., aged two years, was brought to consult him on May 6, 1896. The child's respiration was labored, noisy and rapid, skin of the face of a milky pallor, with marked cyanosis, and the child was only partially conscious of its surroundings.

On examination, the right side of the nose was seen to be occluded by a growth projecting externally. Left nostril was also occluded. The soft palate was pushed forward by a mass presenting itself in the oropharynx. There was no ulceration. The child's dyspnea was so great that Halstead performed tracheotomy almost immediately. Twenty-four hours later there was a hemorrhage through the tube. The child took no nourishment and died two days after the operation. A histological examination of the specimen obtained at autopsy showed it to be a sarcoma.

Melville Black (*Colorado Medical Journal,* April, 1901), has reported a case of papilloma of the soft palate, turning into sarcoma, in a child eleven years old. Two large tumors

of the soft palate were removed, which, microscopically, were reported to be papillomata. There was a recurrence four weeks after the operation, and an examination then showed the tumor to be a round-celled sarcoma. Child died.

Another case of round-celled sarcoma of the pharynx has been reported by Hanszel (Ber. d. Wiener laryngol. Gesellsch. January 9, 1902), in a child three years old. The author states that it developed as a phlegmonous angina.

Schmidt has reported a case of sarcoma of the soft palate in a boy twelve years old. A radical operation was performed, but the final result is not given. (Adolf Schmidt. Alveolar-sarcom des weichen Gaumes. (*Münch. med. Wochenschr.* No. 10, 1904.)

A case of fibro-sarcoma of the nasopharynx has been reported by Mermet (Soc. Anat. Paris, July 14, 1894). A tumor as large as an egg, probably originating in the inferior turbinate, posteriorly, hung down into the pharynx. It occurred in a girl 16 years old.

Another case in a girl of the same age was observed by Simpson (Tr. Amer. Laryngol. Ass., 1893). This was a sarcoma of the soft palate, and another example of the degeneration of a benign into a malignant growth. The soft palate was removed. Death resulted eight months after the operation, and over two years after the development of an apparently benign growth.

To consider briefly now the result of the treatment of sarcoma of the pharynx in children, the outlook, judging by the reported cases, is not very promising.

W. B. Johnson, however (*N. Y. Med. Record,* 1894), has reported a case of sarcoma of the palate successfully treated with the toxins of erysipelas. The patient, a girl, 16 years of age, had a sarcoma involving the soft palate, posterior wall of the pharynx and epiglottis. The mixed toxins were used, and after nine months' treatment, great improvement resulted. The growth "nearly" disappeared.

Hanzel (*Monatscher für Ohrenheilkunde* No. 19, 1902), also reports a case of improvement in a sarcoma of the pharynx as the result of a streptococcus and staphylococcus infection.

Sarcoma of the pharynx in adults will not be considered in the writer's paper.

Emerson has recently reported a case in an adult in which the use of Coley's toxins resulted in the practical disappearance of the growth. There was a recurrence and death after seventeen months. *(Laryngoscope,* March, 1907.)

There are also several cases on record in which the arsenic treatment resulted in some improvement. I could not find any record of its having been used in sarcoma of the pharynx in children.

XXX.

NON-RECURRENT CARCINOMA OF THE LARYNX (REMOVED THROUGH THE NATURAL PASSAGES).*

By E. Fletcher Ingals, M. D.

Chicago.

The results of treatment in carcinoma of the larynx are generally so bad that it is a pleasure to be able to report a case in which there has been no recurrence of the growth for over a year after its removal by endolaryngeal methods, even though nothing in the operation or treatment of the case can be presented as of special interest.

The patient, K. P., was a laborer, 44 years of age, who came to me on the 2nd of January, 1906, complaining of marked hoarseness which had lasted for 6 years. There had been no pain until within the previous three weeks, during which time he had suffered some pain in the region of the left half of the hyoid bone. He was not conscious of having taken any cold, but stated that he had catarrhal symptoms for some time and that the nasal cavities had often been obstructed, although at the time of his visit they were better. His general health was good. There was no dyspnea, the appetite and digestive organs were normal. He stated that the hoarseness had been variable; sometimes having been so bad that he could talk only in a whisper, his voice, at other times, being much stronger, but continually hoarse. There was nothing in the hereditary history to account for the condition, and there was no evidence whatever of lues. The patient's habits were good; he had formerly smoked tobacco but had given it up three weeks before he called upon me, and he had never been accustomed to inhaling the smoke. He stated that his usual weight was 165, and he weighed 163½ at the time of his first visit. The temperature was normal, pulse 68, regular and normal. There was hoarseness and a slight hacking cough, but no dyspnea. Upon inspection I found the nasal cavities about half closed by swelling of the turbinated bodies, but this gave him

*Presented at the American Laryngological Association, Washington, 1907.

no inconvenience. There were no thoracic symptoms. Inspection of the larynx showed a pinkish gray tumor involving the anterior 5-6 of the left vocal cord, filling the opening of the ventricle and extending inward so as to considerably obstruct the glottis, and crowding outward into the ventricular band. This was about 15 mm. long by 8 mm. wide and apparently about 6 mm. in thickness. Some blackish areas on the surface were apparently caused by coal soot. The growth had the appearance of malignancy but it had been present so long that I hoped it might be a simple papilloma. I removed the greater part of it at the first sitting and submitted it to Prof. E. R. LeCount, of Rush Medical College, for examination. After the operation, I directed the patient to keep an ice pack on the neck for 24 hours. He returned two days later, and at that time I was able to see the greater part of the left cord perfectly, but a small part of the growth, about 6 mm. in diameter, remained at the front end of the cord, and a piece somewhat smaller at the back end. At this time I removed all remnants of the growth from the back end of the cord and about half of that from the front end, but could not secure all of it because of the bleeding. The patient returned two days later, at which time he complained of considerable soreness of the larynx, therefore I merely applied a mild solution of zinc sulphate. A similar application was made at the next visit two days later. I did not see him again for a week. In the meantime I had received a report from Prof. LeCount that the neoplasm was a slowly growing carcinoma, with growth toward the surface and considerable keratohyalin transformation of the epithelial cells. At this time I found a growth at the anterior end of the left cord larger than at the last visit, and I removed it thoroughly with a special Mackenzie forcep. After removing this, I found there was a growth of about the same size just below the vocal cord. This I also removed with Mackenzie forceps. I again advised the cold applications to the throat. When he returned four days later he was very hoarse. There was about 15 per cent congestion of the left cord and about 5 per cent of the right. Some roughness of the edge of the left cord, which had been noticed at a previous visit, had disappeared, and no remnants of the growth could be discovered. A mild astringent application was again made. When I again saw him, eleven days later, the left cord was still swollen and the congestion of both cords

was a little more pronounced than it had been at the previous visit. I gave him a small inhaler charged with 5 grains of iodin and 20 grains of menthol, which he was directed to use five or six times a day. This he continued for several months. Two weeks later there had been no reappearance of the growth, but the congestion in the larynx was still more than when I had last seen him. He stated that he had just suffered an attack of influenza, which probably accounted for the increased inflammation. I directed the inhalation to be continued and made a mild astringent application to the larynx. I saw him again in a little over three weeks, at which time the congestion had considerably diminished. Three weeks later the voice was noted to have been clearer, and the patient stated that he was at his regular work daily. I did not see him again for a little over two months, at which time it was noted that the voice was continually growing clearer, and he stated that he could sing, something that he had not been able to do before for many years. The cords, however, were still congested about 8 per cent and both of them were slightly thickened. There was no return of the growth. I did not see him again until January 28, 1907, over a year after the operation. He had been on the Pacific Coast for several months, and stated that for the last three or four months his throat had been perfectly well. His voice, he said, was as good as it ever had been. I found no evidence of return of the growth. In response to a letter he called again on the 14th of February, at which time he stated that the voice continued as good as ever. I found, however, there was slight thickening of the vocal cords and congestion of about 15 per cent, apparently due to a recent cold; however, there was no evidence of any return of the growth. Although interference with malignant laryngeal tumors is likely to stimulate their growth, it appears to me that when there is doubt of the pathology and conditions are such that we have a hope of removing the neoplasm thoroughly by the endolaryngeal method, this operation should be chosen. If microscopic examination reveals malignancy and the tumor returns, laryngotomy or laryngectomy should be at once advised, if there is reason to believe that a thorough removal can be affected.

34 Washington Street, Chicago.

XXXI.

MODERN SURGERY OF THE FAUCIAL TONSIL.*

By Thos. J. Gallaher, A. M., M. D.,

Denver, Colo.

As the success of any surgical procedure is dependent upon an accurate knowledge of the anatomy of the part, I beg the indulgence of this society while I briefly describe the surgical anatomy of the tonsil and its surroundings.

The sinus tonsillaris is a triangular area on the lateral wall of the pharynx, bounded anteriorly by the anterior palatine arch; posteriorly by the posterior palatine arch; externally by the superior constrictor of the pharynx; and below by the side of the pharyngeal portion of the tongue; above it is limited by the junction of the two arches. It contains the tonsil.

At the junction of the two arches, a reduplication of the membrane is found, the plica triangularis, which covers the supratonsillar fossa. As the membrane covering the anterior and inferior portions of the tonsil is also called the plica triangularis, some authors call this plica above the tonsil the plica supratonsillaris, which avoids confusion. The plica supratonsillaris, hence, bounds the supratonsillar fossa above with its semilunar margin. It has an anterior and a posterior cornu, which are continuous respectively with the anterior and posterior pillars. The plica tonsillaris inferior is reflected from the mucous membrane of the anterior pillar upon the tonsil, covering it anteriorly and extending along its inferior border for a variable distance, often reaching the posterior pillar. At the point where the plica is reflected upon the tonsil, a sharp angle is formed by the plica and the anterior pillar, which may properly be called the commissure of the anterior tonsillar fossa.

The tonsil, together with the different reflections of the mucous membrane, forms with the arches three distinct fossae; viz., the anterior, supratonsillar and posterior.

---

*Read at the Thirteenth Annual Meeting of the American Laryngological, Rhinological and Otological Society, New York City, May 30, 1907.

The anterior fossa is bounded in front by part of the anterior pillar; above by the commissure of the anterior fossa (or point of divergence of the anterior palatine arch and plica triangularis); posteriorly by the anterior border of the tonsil (with its plica); below by the tissues of the side of the tongue. The supratonsillar fossa is bounded above by the semilunar margin of the plica supratonsillaris; anteriorly and posteriorly by the anterior and posterior cornua of the plica supratonsillaris; below by the superior margin of the tonsil. The posterior fossa is bounded anteriorly by the posterior border of the tonsil; above by the commissure; that is, the point of divergence of the mucous membrane of the posterior pillar and the membrane reflected from it upon the tonsil; posteriorly by the posterior arch; inferiorly it is continuous with the lateral wall of the pharynx. The anterior fossa is always present and is usually of considerable size. The superior fossa is also constant and quite variable in its extent. The posterior fossa is not so distinct, but can usually be made out. The anterior and posterior pillars are formed by the projection of the palatoglossi and palatopharyngei muscles covered with mucous membrane. The posterior pillar on each side is nearer to its opposite arch than is the anterior to its opposite, consequently the posterior pillar covers much more of the tonsil than does the anterior. It is owing to this fact that the posterior fossa is limited in its extent.

The distribution and direction of the tonsillar crypts perhaps influence us most in determining the extent of the tonsil operations. The crypts in the superior portion extend downward and outward to the capsule and are often closely covered by the plica supratonsillaris. The crypts in the middle and lower portions of the tonsil extend more horizontally and upward. The middle and lower crypts are, therefore, more easily drained than the upper crypts. It is from the upper crypts usually that infection produces peritonsillar abscess. It is of greatest importance that the velar or superior lobe of the tonsil should be removed to prevent a recurrence of this infection. The crypts are both simple and compound and extend from the surface of tonsil externally to the capsule. The capsule is the fibrous membrane covering the external portion of the tonsil and is loosely attached to the superior constrictor.

We shall briefly call attention to the blood supply of the tonsil. The arteries supplying the tonsils are the dorsalis linguae from the lingual, the ascending palatine and tonsillar from the facial, the ascending pharyngeal from external carotid, the descending palatine branch of the internal maxillary and a twig from the small meningeal.

The point of practical importance in regard to the blood supply is that the arteries pass external to the superior constrictor, through which they continue and then divide into the smaller vessels, which enter the tonsil through the capsule, hence care should be exercised that none of the vessels be wounded far from the capsule. Normally, the internal carotid artery lies behind and to the outer side of the tonsil, nearly an inch distant from it, in the posterior portion of the pharyngomaxillary interspace. Barring an anomalous position of the internal carotid, which will be shown by the visible pulsations of the tonsil, this vessel is not at all likely to be wounded. The veins terminate in the tonsillar plexus in the outer and lower portion.

A branch of the glossopharyngeal nerve, by uniting with branches of the pharyngeal plexus, forms the tonsillar plexus.

The excellent work of Goodale, Wright, Ballenger, Myles, Mosher, Wood, Robertson, Babbitt and others has given the proper status to the normal and diseased tonsil. There is no longer any doubt that many infectious germs gain entrance to the system through the tonsil. It is, indeed, a sign of the times that the so-called rheumatic attacks following acute tonsillitis have been placed in the category of septic infections.

Operations upon the tonsil may be divided into the simple type of operations and the radical tonsil operation. Among the simple operations may be included the slitting of the crypts by the knife or galvano-cautery, reduction of the tonsillar tissue by the galvano-cautery and, lastly, tonsillotomy. These operations are seldom of choice, and are usually done only when it seems most expedient under existing circumstances. As an example, it is better to reduce a hypertrophied tonsil by means of the galvano-cautery rather than to do the radical operation when any doubt exists as to the position of the internal carotid or any large anomalous vessels. As to tonsillotomy, it is certainly a most incomplete operation, and its results are very often most disappointing. The tonsillotome soon will be seldom used.

The radical tonsil operation consists in the complete exenteration of the sinus tonsillaris. As radical operations are rather in favor today, I take the liberty of using the term in reference to the tonsil. There is no more reason for doing an incomplete tonsillar operation, when its removal is indicated, than there is for imperfectly performing any surgical operation. While many operators have been very careful to remove all of the diseased mastoid cells, they but partially remove the diseased tonsillar tissue.

We will not discuss the indication for removal of the tonsil, but when its evisceration is attempted the radical operation only should be done. It is only such work that will prove satisfactory to both the sufferer and operator. We can assure our patients perfect immunity from tonsillitis, peritonsillar abscess and the serious constitutional disturbances. Indeed, the failure to bring the desired relief by the partial removal of the tonsil has brought upon the laryngologist much just criticism. In the institutions in our larger cities today, it is still an exception to find an operator who is doing a complete radical operation. Great credit should be given to Ballenger, who has been advocating for years the complete removal of the tonsil. The first complete enucleation which I saw was performed by him was some years ago. Since coming to this meeting, he tells me that he has still further improved his technic, which I hope he will describe in his discussion before the society.

Every operator will, of course, have his favorite method, and many technics have been given to the profession within the last few years. A large number of instruments have been devised for the purpose, including knives, scissors, various punches, snares, etc.

In performing the radical operation I, personally, use the following: A suitable tenaculum forceps, the Pierce knife, the Kyle crypt knife which has long been recommended by Ballenger, and a slight modification of the Peter's snare. The operation may be called the dissection and snare operation. The snare is often improperly used and should never be placed around the tonsil without a thorough loosening of the organ from the sinus tonsillaris. It matters not about the shape of the tonsil or as to the amount of the tonsillar tissue projecting beyond the pillars. This operation will always be found applicable and thorough. In the adult, when operating without general anesthesia, we inject a mild solution of cocain

and adnephrin or adrenalin along the line of incision, waiting one minute and proceeding. In children under general anesthesia, occasionally we inject a weak adnephrin or adrenalin solution or apply locally.

The tonsil is first seized with a tenaculum forceps and drawn internally to accurately show its outline. An incision is then made with the Pierce knife along its posterior border, which quickly and easily frees it from its attachment. This incision extends from the lower margin of the tonsil along its posterior border to the commissure of the posterior fossa. The Kyle knife is then used, cutting through the posterior commissure, and extending the incision over the upper margin of the tonsil; that is, through the supratonsillar fossa. Next an incision is made with the Kyle knife along the inferior attachment of the tonsil and extending upward, separating the plica triangularis inferior along its outer boundary to the commissure. This is continued upward through the commissure and joins the upper incision in the supratonsillar fossa. After these incisions are made, the tonsil is no longer held within the sinus tonsillaris, and a slight traction on the forceps, toward the median line, will cause a beautiful eversion of the tonsil, so that the capsule of the tonsil, which is loosely attached to the constrictor, is drawn internally to about the same plane as the anterior pillar. The dissection can then be continued directly backward, and, also, further liberation of tonsil made along its superior margin. The entire tonsil can be dissected out by means of these knives, but the use of the snare facilitates the operation somewhat and possibly lessens the danger of hemorrhage. We use the No. 7 piano wire and a slightly modified Peter's snare, with no tips, and find that the plain wire can be much more easily insinuated external to the capsule. The same wire can be used for both tonsils. The tonsil is usually removed completely with its capsule intact. After the operation, the sinus tonsillaris should be carefully inspected with a small forceps to see if any fragments of the tonsil remain, especially in the upper portion. If any are found they should be removed.

Dangerous and Faulty Technic: The plica supratonsillaris should be cut through only at the anterior and posterior cornua and not through the semilunar margin.

Laceration of the constrictor and wounding of the larger vessels external to it, which would produce very troublesome hemorrhage.

Cutting of the palatoglossi or palatopharyngei muscles which will certainly give contractions of the palate. The contractions are more liable to be produced by the laceration of the posterior pillar.

Incomplete severing of the marginal attachments which permits the surrounding tissue, especially above, to be drawn into the snare and wounded.

Insufficient loosening of the capsule from the constrictor.

Too much stress cannot be placed upon the importance of the careful dissection of the velar lobe from its attachments, as it is common for the inexperienced operator to leave much of this lobe in the sinus. Hence, it is wise to always inspect the sinus, as suggested above.

In a record of over one hundred and twenty-five cases, in the adult, by this method, the only bleeding that we have had has been incidental to the dissection, and in each instance, after the snare had completely enucleated the tonsil, the bleeding stopped spontaneously. My experience has been that it is in the cases of incomplete removal of the tonsil that the serious hemorrhages occur, the soft tissues preventing proper retraction of the vessel. In children; I prefer general anesthesia.

The technic as described above requires simple and few instruments, and certainly insures a most thorough evisceration.

While the radical tonsil operation requires much care and a keen appreciation of the anatomy, I am satisfied that when any operator has become proficient in its performance, that there will be but one operation which he will do for those suffering from diseased tonsils—the one which will positively insure immunity from any further inconvenience—the one which will be a boon to his patient and a satisfaction to himself—namely, the radical tonsil operation.

XXXII.

REPORT OF CASE OF TRAUMATIC ETHMOIDITIS—CEREBRAL ABSCESS—DEATH DURING OPERATION—AUTOPSY.

By J. A. Stucky, M. D.,

Lexington, Ky.

The following unique case is presented for your consideration, believing it to be one of a class of cases in which the accessory sinuses of the nose are involved, that calls for more than a passing notice.

A. F., aet. 16, living in the mountains of Kentucky, was admitted to the Good Samaritan Hospital on August 13, 1906, having fallen from a fence four feet high, four months previously, striking her nose on a piece of timber, fracturing the nasal bones—pieces of bone coming out of anterior nares two weeks later. Complains of constant pains through the head, more severe at times. especially when stooping or jarred. Pain through eye, especially left one, which is almost blind. Convergent strabismus of the left eye: V. R. 20/20, V. L. 20/80. Pain on deep pressure over left eye, particularly over temples. General health below par. Much cough. Unable to use ophthalmoscope on account of irritability, fighting, etc. Family history good. Transillumination of frontal sinus positive. Antrum negative. Vertigo when stooping, pain and dizziness increased when blowing nose. Bridge of nose swollen and tender. Every evidence of fracture. Examination of anterior nares showed cartilaginous septum torn from the vomer, pushed over against the middle turbinate, the middle turbinate adherent to antral wall and pus oozing from above and below tip. Posterior nares full of pus. Probe shows roughness and degeneration of ethmoid cells. On August 15th, under general anesthesia, the septum was straightened, the middle turbinate removed, granulations and pus removed, anterior ethmoid cells and sphenoid sinus curetted. Four days later, strabismus relieved, vision normal, complains of no headache. Did not see patient again for a week. September 4th: Pain increasing for past few days. Nose swollen, discharge ceased. Vision R. & L., 20/15.

+1.25 D., equaling 20/20+. Ophthalmoscope shows edematous retina and papillary neuritis. Is irritable, despondent, threatens suicide. Complains of constant and increasing pains, relieved by cocain and adrenalin sprayed into the nose.

September 5th: Complains of more pain. Pulse 64, temperature 98. No appetite, restless and very irritable, hysterical; laughing, moaning, crying alternately. Respiration, shallow. Dr. G. P. Sprague called in consultation. Decided to wait twenty-four hours, and explore accessory sinuses. One-twelfth grain heroin given hypodermically.

September 6th: Had a good night, is brighter, less irritable and despondent and anxious to have operation. Is prepared for operation by free purgation, followed by baths and enema. At 1 o'clock nurse reports that she has another hysterical attack. At 2:45 I saw her, respiration jerky and shallow, tossing head and throwing arms; would reply to no questions. Pupils still partly dilated, but reacted equally to light (had homatropine twenty-four hours before for refraction), forehead, eyes and upper part of face slightly edematous and cyanotic. General condition bad, but symptoms of pressure increasing, patient was taken to operating room. Condition improved under ether, requiring unusually small amount for narcosis. Postnasal tampon inserted. Nasal cavity and ethmoid and sphenoid examined. Granulation tissue and slough removed with curette. Very little bleeding from nose. Incision for Killian's radical operation on frontal sinus was made; the edematous tissue bled freely, and was controlled by retractors. Periosteum was very dark color, much thickened and very soft when removed. Continuous and rapid bleeding from bone for a space around nasofrontal articulation size of a silver dime. At this point the outer table of frontal sinus, which was unusually soft, thin and vascular, was removed with a chisel, and the entire sinus, which was of exceptionally large size, was filled with firm, organized clot, which was disintegrating in spots. When the clot was removed, the respiration suddenly ceased, and notwithstanding that all the known methods of restoration were used by Drs. Estill, Sprague, Griggsby and myself, the patient never rallied. Death was practically instantaneous. Artificial respiration was continued for nearly two hours. Normal saline solution injected intravenously, strychnia and atropin given hypodermically.

Notes of Dr. G. P. Sprague, neurologist: "Patient, Amanda F., September 5th, was seen at Good Samaritan Hospital.

Is a large, well developed white girl, age 16, of fair nutrition, symmetrical build and intelligent appearance. Is anemic, pulse varies from 80 to 85, of fair volume and regular. Respiration normal, temperature 97°, pupils equally dilated by homatropin, tongue protruded without deviation or tremor. Both knee jerks absent, even when reinforced. No ankle-clonus nor Babinsky reflex. Stands fairly well with feet together and eyes shut. Complains all the time in whining, sing-song groan of pain in the left half of the forehead, from the midline to the ear, and has not had pain anywhere except over the entire frontal bone, where the pain is sometimes worse on the right than on the left. Nose is swelled, but not sore. Pressure on right frontal region causes pain in left temporal region. Talks quietly for a minute. Laughing and joking with the nurse, calling to nurses whose step she recognizes about the ward and then suddenly groans and whines for ice, to have her head rubbed, to be fanned, etc. Pettishly refuses to write her name or anything else, though admitting that she can write. Says she won't if she is asked all day, and that she never does anything when she says she wouldn't. Has no symptom of either motor or sensory disturbance, except as noted. Diagnosis, cerebral abscess or meningitis, caused by inflammation and pus in the frontal and ethmoidal sinus, leaning to the latter.

"Autopsy twenty hours after death. Only the brain was examined. There was no fluid in the ventricles, no apparent disease of the dura or the pia arachnoid, except over the left cribriform plate and in the sella tursica, where the pia and dura were both adherent. The left cribriform plate was necrotic, with a fracture through the inner table of the left frontal sinus. The entire anterior and middle cerebral convolutions softened and infiltrated by pale green pus of creamy consistency. Just internal to the cribriform plate in the anterior convolution, there was a thick, tough, gritty substance, the remains, apparently, of an abscess cyst wall, holding approximately one dram, while there must have been several ounces of pus altogether. The abscess had evidently ruptured into the brain substance, but there was no indication that it had been connected with any sinus or other cavity."

The interesting features of this case are: (1) The extreme rarity of an injury to the nose resulting in infection of ethmoid cells and frontal sinus. (2) The mental symp-

toms caused by the resulting septic condition. (3) The strabismus and amblyopia caused by pressure in sphenoidal sinus, which was relieved as soon as the pressure was released. (4) The absence of focalizing symptoms, even when so large an area of the brain is involved in so decided pathological condition. Query: Given a similar case, what would be the best operative procedure? Would I have been justified in searching for cerebral abscess with no more focalizing symptoms than presented by this case? It is greatly desired to have the counsel of the neurologist in cases like this, and others in which we have marked mental symptoms accompanying suppuration of the nasal accessory sinuses.

XXXIII.

A CASE OF ADENO-CARCINOMA, SITUATED IN THE RIGHT MAXILLARY ANTRUM, REPORTED ONE YEAR AND A HALF AFTER OPERATION.

By Lee Maidment Hurd, M. D.

New York.

C. F., aged 59, U. S.; occupation, milkman, previous history clear; first seen on December 6, 1905, when he gave the following history: Twelve to fourteen months ago he began to notice swelling of the face and hard palate. For the past ten years, he says, he has had a small swelling on the alveolar process. The teeth on that side fell out about five years ago, also some on the opposite side. The only subjective symptom which the growth gave was nasal obstruction. The growth, where it had broken through the bone, had a cystic feel. The swelling in the mouth has obliterated the usual landmarks, and was one smooth swelling from the gingivo-labial fold well beyond the median line, involving the alveolar process as far as the left canine tooth. The anterior surface of the growth markedly bulged the cheek on that side, and overrode the infraorbital ridge and the nasal bone. The naso-antral wall bulged into the nose, and pushed the septum over until it touched the opposite side. The growth had caused absorption of the bone in several directions, namely, the anterior and inferior antral walls, and probably the nasal walls. His heart and lungs were normal, kidneys slightly congested. He had been a steady whiskey drinker for years, averaging ten drinks daily.

December 9, 1905, operation. The external carotid was ligated. Some slight delay was caused here by the bifurcation arising rather high up under the hypoglossal nerve. I believe the ligation of the external carotid to be an important step in all growths of the nose or upper jaw, inasmuch as it saves shocks from hemorrhage, and causes an after-anemia that discourages immediate recurrence. It also gives one an opportunity to inspect and remove any suspicious glands that otherwise would not be recognized.

The Weber, or Fergusson, incision was made—that is, along the infraorbital ridge to the inner angle of the eye, then down the junction of cheek and nose, following closely the boundary of the nose, until the median line is reached, then dividing the upper lip. On reflecting this flap, the periosteum was found to be adherent, so instead of trying to separate it, I went through the tissue of the cheek. The periosteum of the orbital floor was easily elevated; the growth had not bulged into the orbit, but the nasal process of the superior maxilla and nasal bone were softened. They were removed with bone forceps, and the separation of the bone was extended back through the orbital floor to the sphenomaxillary fissure. This bone is very thin and can be easily divided, care being taken not to injure the orbital tissues. Next a Gigli saw was passed through the sphenomaxillary fissure out the nasal fossa, and the malar bone was divided in about the line of the sphenomaxillary fissure. Next the hard palate, from a point between the second incisor and the left canine tooth was divided directly back to the soft palate, and also the nasal septum through the anterior naris was separated from the hard palate. This was done with a chisel, as the quickest method. The soft palate was separated from the hard with a right angled knife. The superior maxilla was then easily removed.

The ligated external carotid made the procedure practically bloodless, not a ligature being used. The wound was closed and the cavity was packed with iodoform gauze, which was held in place by fixation sutures from the hard palate through the tissues of the cheek. Duration of operation, 50 minutes.

The patient suffered no shock. The iodoform gauze was removed on the second day, and was not replaced. To my surprise, he could drink fairly well, notwithstanding that the cavities of the nose and mouth were practically one. He went on to complete healing, without after treatment of any kind, except an antiseptic mouth wash.

The growth was submitted to Dr. Jonathan Wright for examination, who reported as follows: "This growth is an adenoma. The interest, both clinically and histologically, is whether we are to consider it malignant or benign. In many places the type is one of simple row formation, run wild, but not clustered into irregular clumps or cells, which in this kind of case I have been accustomed to associate with malignancy. In several of the places, however, this massing of the cells in

the stroma is evident. In these localities, and a few others, a little suggestion of gland structure is to be noted. In other places the cells are arranged around a blood vessel for a center. In these sections, I do not make out any of the irregular karyokinesis, which is a striking intracellular feature in malignant growths. From my experience with such cases as this, I am inclined to think, in spite of several very dubious areas, that there is a good chance that this growth, even with repeated recurrences, may finally be entirely and permanently eradicated. If possible, the site of the growth should be promptly exposed, so that any recurrence may be observed and extirpated."

December 21, Dr. Wright sent me this supplementary report: "On examination of other portions of this growth, I am inclined to think we must give up any hope of its clinical non-malignancy. There is too much atypical proliferation not to expect prompt recurrence and metastases."

On the strength of this latter report, I thought I would take time by the forelock, and immediately had the wound X-rayed twice a week for three months, with the idea that, if there remained any abnormal cells, or any should re-form, the over-stimulation of the X-rays might destroy them.

Now, at the end of eighteen months, there is no sign of recurrence, and the nasal mucous membrane has accustomed itself to food and condiments, so that articles like vinegar, pepper, whiskey, etc., do not seem to irritate the membrane covering the turbinates. This membrane is not congested, and, if anything, the color resembles the buccal membrane rather than the normal nasal membranes.

The resulting deformity is very slight. The most noticeable thing is ectropion of the lower lid He has now a prosthetic plate, which restores the normal voice. The eye has dropped some, his diplopia is so great that he entirely disregards the second image.

What has this non-recurrence proved? Was it due to the X-ray. I think not, even though the rays in this case were fairly well directed upon the wound surface—as the X-rayists are mostly of one opinion, namely, that the rays are not of much value in carcinomatous conditions.

Was Dr. Wright's first opinion correct, and not his second report? I have the highest regard for Dr. Wright's opinion, and think he probably was right when he said: "On further examination of the growth, it was probably malignant."

May not the good results in this case be due to the radical operation? The operation was carried well into healthy tissue on every side of the growth. Most of the cases of adenoma or adeno-carcinoma of the nose have been simply curetted out, and nearly always have been followed by recurrence, until after many curettings the patient died.

15 East Forty-eighth St.

XXXIV.

A SECOND REPORT ON A CASE OF EPITHELIOMA OF THE UVULA OPERATED FIVE YEARS AGO, WITHOUT RECURRENCE.

By James F. McCaw, M. D.,

Watertown, N. Y.

This case of primary epithelioma of the uvula and soft palate was seen in consultation on November 19, 1901, through the courtesy of Dr. E. S. Willard, of Watertown, N. Y., a detailed report of which will be found in the transactions of this society for 1902. I will here briefly rehearse the important points in the case that we may better understand the nature and extent of involvement when first seen.

The history of obscure abdominal growths in two sisters, one of whom died from an attempt to remove the growth several years before. The patient, a female, had always enjoyed good health, and with no other throat difficulty, except an occasional attack of quinsy. Her present trouble began about eight months before coming under observation with soreness and slight throat irritation. In a short time several small ulcerations were noticed on the soft palate. Under treatment for "cancred sore throat" these seemed to improve, but never entirely disappeared. About October 1, 1901, the soft palate began to enlarge and very rapidly fill the throat. This was quickly followed by dysphagia, pain, muffled intonation and soreness in the cervical muscles. Six weeks later, when first seen by the writer, a mass involving the uvula, soft palate, posterior faucial pillars, the right lateral and a portion of the posterior pharyngeal wall was seen. The mass almost filled the right side of the pharynx, presented an irregular modulated outline ulcerated and necrotic surface and a dense, cartilaginous feel to the touch.

---

*Read at the annual meeting of the American Laryngological, Rhinological and Otological Society, New York City, May 30, 31 and June 1, 1907.

The treatment employed was thorough excision of the growth with electro-cautery knife, curetting, and deep cauterization of the raw surfaces, and subsequent irradiation with the Roentgen Ray. After two operations, according to the above method, the last, March 7, 1902, followed by exposing the areas to the influence of the X-ray, the parts healed kindly after about twelve weeks of such treatment.

This case has been kept under constant observation and regularly examined at intervals of about six months ever since, either by her family physician or myself, and at no time has there been the slightest indication of a recurrence. From a weak, frail, anemic and despondent individual, she has gradually developed into a hardy, robust and cheerful person, gained thirty pounds in weight, and is in better physical condition than for years. The palatal and pharyngeal muscles functionate with perfect ease, the scar tissue is scarcely noticeable, the only apparent deformity being the loss of the uvula, and slight tension of the velum palati, the posterior faucial pillars forming a narrower arch.

In view of the fact that this patient has remained free from the slightest indication of a recurrence for a period of five years, we are warranted in assuming that the original process has been adequately removed.

In this connection the question arises in my mind: May we not have different degrees of malignancy inherent in growths, pathologically of the same type? The same, for example, as we have different degrees of severity in cases of diphtheria, typhoid fever, follicular tonsillitis and a host of other conditions. This, together with the variable resisting power of different individuals would theoretically account for the cases of reported cures of malignant disease. The whole question of malignancy—where it begins, where it ends and its etiology—is still so indefinite that we are unable to say the length of time that must elapse before a recurrence or matastases are improbable. Until we have more exact knowledge of these important factors, we think it wise not to report our cases of malignant disease as cured, but as having remained so long without a recurrence or matastasis. My case today, after five years, is still without a local recurrence or discoverable matastatic deposit.

XXXV.

THE IMPORTANCE OF AURAL INSPECTIONS AND FUNCTIONAL TESTS IN HEALTHY INDIVIDUALS.

A PLEA FOR THE PREVENTION OF DEAFNESS.

By W. Sohier Bryant, A. M., M. D.,

New York.

No organ of the human body can undergo greater deterioration without knowledge of its possessor than the ear. It is not at all unusual for an otologist to observe patients who complain of some other defect than hearing and who do not consider themselves deficient in this respect, although their hearing distance is less than one-tenth of normal. According to the law that the intensity of sound varies as the square of the distance, these people have less than one per cent of normal sound perception. Man inherits much greater acuteness of hearing than he is called upon to use if he lives in a civilized community. Consequently, he does not notice the loss of the accessory increment of this sense, and is able to dispense with all but a very small fraction of his natural hearing, even to below one per cent, without interference with his daily life. If one ear has normal hearing, the other may lose all its hearing power without the knowledge of the individual, unless his attention is called to the fact by some peculiar circumstance interfering with the function of the good ear.

The acuteness of normal hearing may be described by a curve which rises from zero at birth, attains its maximums at the completion of adolescence, and gradually declines to a very low point in old age. If anything prevents the normal rise of the curve during adolescence or depresses it to a point below normal, the subsequent curve is parallel to the normal, approaching the abscissa at an early period, and causing premature loss of efficient hearing. Usually chronic defects in

---

*Read at the Annual Meeting of the Medical Society of the State of New York, Albany, January 29, 1907.

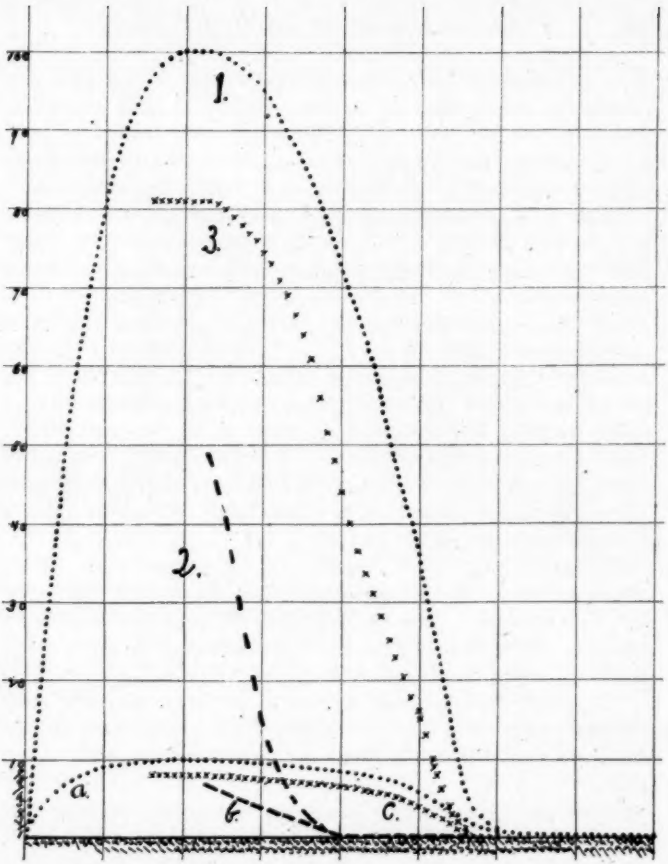


DIAGRAM.

The line at the base of the diagram indicates the abscissa of hearing and the numbers thereunder the age of the subject. The lower numbers on the scale on the left indicate the ordinate of the hearing distance, the maximum being 10. The higher numbers indicate the hearing power, being the square of the distance.

a.—The curve of the normal hearing distance. 1. The curve of the normal hearing power, which is the square of a. Both curves reach their maximum in the 19th year, continuing there till the 25th year, when they begin to fall.

b.—A curve of the hearing distance. Here there is a diseased condition of the ears, untreated. The curve begins with a sudden drop in the 23d year, reaching 0 about the 40th year. 2. The curve of hearing power under the same conditions.

c.—A curve of the hearing distance. Here the hearing has been affected by some accident or non-progressive disturbance of hearing, without treatment. The curve begins with a sudden drop in the 15th year. From this point its course is nearly parallel to a. 3. Is the hearing power of c.

hearing do not tend to spontaneous recovery or even to a position of status quo, but on the contrary are likely to grow worse. In these cases, the descending curve, instead of falling parallel to the normal, drops much more abruptly, causing a still earlier loss of hearing than would otherwise obtain.

There is an important difference between the sense of hearing and that of sight, which explains the fact that a considerable diminution in hearing power may occur without the patient's knowledge, whereas, a much smaller loss of sight would cause serious annoyance. The power to hear decreases as the square of the distance or in proportion to the intensity of sound. Sight decreases in proportion as defects in the transparent media cloud the details of the object, thus emphasizing slight imperfection of the sense organ. With hearing, on the other hand, it is a question of volume of sound, as long as the volume is sufficiently loud to be perceived, no defect is noted by the individual.

Since hearing may be lost to a large extent before any notice is taken of it by the patient, his cognizance of the loss is an indication of considerable functional impairment, the result of proportionately advanced pathologic processes, which are proverbially hard to check and the effects of which are still more difficult to eradicate.

The chief reason these conditions resist treatment is that the pathologic processes have gone so far by the time the loss of hearing is sufficiently great to attract the patient's attention.

Most cases of deafness occurring in middle or later life are due to so-called chronic middle ear catarrh, in which there is a gradual process of fibrosis, atrophy and degeneration affecting the drum membrane and the contents of the middle ear. This results in sclerosis, loss of normal cell elements and deposition of lime salts, conditions which can be combated successfully in their incipiency, but which, when the tissue changes are long standing and extensive, make stubborn resistance, just as similar conditions would affect the eye, or any other organ.

Chronic suppurative diseases of the ear are the cause of most of the remaining cases of deafness. This affection is dangerous to life as well as detrimental to hearing. The decrease of hearing is in proportion to the destruction of the tissues of the sound-conducting and sound-perceiving mechan-

isms of the ear, and becomes greater with the continued formation of pus. The parts which are lost in the ulcerative lesion consequent to the suppuration cannot be restored any more than can other joints, bones, or tissues which are lost in a similar way; therefore, the restoration of the hearing even after the suppurative process has been arrested, is largely, except for the cessation of inflammation, dependent upon mechanical appliances rather than upon restoration of any of the lost parts. This is true with the exception of the drum membrane which has a remarkable power of repairing its defects by substituting a cicatricial membrane for the parts destroyed. The suppurative process may be so slow and the ulcerative destruction of tissue may go on so imperceptibly that the patient does not realize his condition. Carious destruction of bone may progress under these circumstances, even to exposure of the meninges without any definite subjective symptom save an occasional headache. Early examination of the ears will detect the cause of insidious loss of hearing most dreaded by the otologist, namely, rarefaction of the labyrinthine capsule—a disease which, taken in time, offers fair hope of arrest before the damage is irremediable.

Accumulations of cerumen in the external auditory canal do not interfere markedly with hearing until the canal is heremetically closed. But their presence is detrimental to the healthy condition of the canal and middle ear. The diagnosis of osteomata, which are the commonest new growths to cause occlusion of the canal, is readily made on inspection, and treatment is satisfactory in its results. If these growths are allowed to close the canal, the danger to the individual is considerable, not only because the patient loses the hearing in the ear for the time being, but also because of the irritation which this stoppage engenders, and the consequent suppuration of the middle ear.

Parasitic growths, such as the aspergilli, may exist in the external meatus and flourish there without causing any special symptom until they penetrate the deeper layers of the epithelium. The violent inflammation which results is not only distressing to the patient, but by perforating the drum membrane and infecting the cavaties within, invades the middle ear and mastoid cells.

Besides the destruction of the tissue of the ear and the diminution of hearing distance which may occur without the

knowledge of the patient, he may unconsciously suffer curtailment in the range of his hearing. The perception for notes at either end of the scale is sometimes lost or there may be blanks anywhere. The higher notes which are rarely used in daily life, may be completely lost as well as the lower tones. Unless a person is a trained musician a considerable deficiency may not be recognized. Decreased high-tone perception indicates serious labyrinthine changes which may not be suspected until the middle register is interfered with. Decrease of low-tone perception is consequent upon disturbances in the sound-conducting apparatus of the middle ear. Deviations from the normal range of sound perception indicate pathological conditions which, if unchecked, are apt to progress and cause still greater defects.

It is customary to seek an otologist's advice when there is an acute aural disease, or when there is enough loss of efficient hearing to cause much inconvenience, which, as we have seen, indicates very far advanced pathologic changes. It is not generally understood that changes in the ear, unlike the eye or other organs of the body, may progress and cause serious damage before their presence is suspected by the patient. The patient usually does not seek advice until he can no longer carry on his daily vocation when the hearing is so bad that the effort to listen has become a serious burden. I maintain that more can be accomplished by prophylactic watchfulness of the ears than by similar care of other parts of the body. Vertigo, tinnitus, deafness, and the danger of systemic infection and intracranial lesions from chronic suppuration can commonly be prevented if the morbid changes in the ear which cause them receive adequate treatment in their incipiency.

The subjective feelings of the patient, or tests carelessly applied are very uncertain and misleading because the results are so largely affected by mental bias and preconceived estimate of the conditions present. The only way to determine the actual condition of the hearing distance is that of careful, scientific tests.

If the ear is examined it will give early indications of impairment of function, either of the sound-conducting mechanism (middle ear disease), of the sound-perceiving mechanism (labyrinthine disease), or of the nerve itself (neuritis or pressing tumors), or of the auditory centers (intracranial dis-

turbances), or of the whole nervous system, as in neurasthenia.

I recommend that the otologist be consulted during the patient's health for the detection of commencing changes in the ears. These organs are then amenable to treatment, and thus can the later chronic, deplorable conditions be avoided. The ears should be tested to determine the hearing distance and range. This should be done whenever there has been any severe constitutional disturbance, or when there has been an affection of the upper air tract. The ears should be tested at intervals of a year or two according to the age of the patient.

CONCLUSIONS.

Periodical examinations of the ears should be made and functional tests applied at all ages and after any general disease or affection of the upper air tract, inasmuch as serious damage to the ears may take place without the knowledge of the patient. When the individual is aware of the impairment, the pathological changes have advanced far enough to render recovery difficult. The early detection of aural disturbances allows adequate treatment, with the expectation of the prevention of aural vertigo, tinnitus, deafness, intracranial lesions from middle ear suppuration, and the dangers of systemic infection.

XXXVI.

THE PHYSICAL EXAMINATION OF CLEVELAND SCHOOL CHILDREN*.

By George W. Ehler, C. E.

Cleveland.

Supervisor of Physical Training, Hygiene and School sanitation.

The purpose of this paper is strictly information. There is no need that before this body one should discuss the question as to whether school children should be subjected to thorough medical and physical examination. It is taken for granted that all here are agreed upon the general proposition. There might be room for discussion upon the scope, the methods and the means of such examinations, but the paper will confine itself to a statement of what has been done in this direction, what is being attempted at the present time, and what is proposed for the future.

Cleveland was among the first cities in the country to introduce an examination of the vision and hearing of school children. This practice was begun several years ago under the direction of Dr. L. K. Baker, at that time Supervisor of Physical Training. The tests for acuity of vision and of hearing were conducted by the regular grade teachers, using the Snellen's card for the former and the Gale test for the latter. Record was also made of the appearance of the eyes and lids, of strabismus, pain or aching of eyes or head or ears, and of the presence of pus or odors from the ears.

Reports of all children having symptoms under any of these items were submitted to the supervisor and notices were sent by the teachers to parents. Children whose parents failed to take measures to relieve children found defective, or whose parents were too poor to secure proper medical service, were examined by the supervisor, eyes being refracted in large numbers of cases and treatment prescribed. An annual re-examination was made of those who previously had been

found defective, and every four years an examination was made of all pupils above the first grade. Many children of indigent families were aided, some by money subscribed to pay for glasses, and others by the Municipal Department of Charities.

In 1904 this work came under the direction of the present administration. An examination of all children above the first grade was ordered, and the results were tabulated. The percentage of children reported with one or both eyes defective varied from eight to thirty-three per cent of the total number in different schools. Some of the lowest percentages were reported from badly lighted buildings and from schools attended by children of poor families. Rooms of the same grade in the same buildings reported percentages varying from 2 to 80. These percentages led to suspicion of the reliability of the examination. And when a study is made of the conditions under which the examination was conducted it is readily seen that its value is very questionable as least in regard to vision, and yet it is a method quite generally followed, and the latest law on this subject passed last fall by the legislature of Massachusetts, prescribes that such examinations shall be done by the regular grade teachers.

The method has the advantage of economy and it is conceivable that its disadvantages might be largely overcome, but it seems rather doubtful. Teachers consider it another burden, they have little or no training for it, it must be done in the school room, either before or after school, at recess or the noon intermission. It should be done with no other child present. This precludes during the period of the examination all scholastic help to other pupils. To save time, several children are usually in the room at the same time. This tends to invalidate the visual test. Then in some places it is quite the thing not to be able to read the test type. One principal tells of an experience in this connection. A teacher reported every child in the room defective in vision. The principal was suspicious. She called the pupils to her room separately, no communication being permitted between them in the meantime. She found only a small percentage defective. This is sufficient to indicate the possibilities of error.

It was planned to make a re-examination in 1905 for the purposes of comparison but a petition of the principals that the teachers be relieved of the work led to its being dropped

and plans were laid to have it done by the physical training teachers. During the fall of 1906 this plan was put into operation. The special teachers of the physical training are all persons, with the exception of one or two, who have graduated from modern normal schools of physical education and are therefore quite well qualified to do at least what has heretofore not been thought too difficult for the grade teachers. They are all students of physiology and hygiene and the principles of physical training and therefore conversant with the functions of the chief organs and of their hygiene and of their usual defects. They should therefore have a reasonable degree of ability to determine, within certain limits, whether the eyes, the ears, the teeth and the nose are in a normal state.

Under these circumstances it was determined to broaden the scope of the examination somewhat, for the purpose of presenting an object lesson to the Board of Education and to the community, that might serve to secure the establishment of a really comprehensive and thorough physical and medical examination and such administration of the same as would, we believe, produce results commensurate with the need.

A card record was planned for each child from the second to the seventh grade inclusive. Each card included the following items: Name, date of birth, date of examination, school, grade, scholarship; under heading Eyes—R. vision, L. vision, strabismus, inflammation, ache (of eyes or head) and fatigue; under Ears—R. hearing, L. hearing, ache, pus and odor; under Nose—nasal obstruction, and mouth breathing; under Teeth—dirty, defective. A vertical ruling into columns provided space for re-examinations.

The first group of items was to be filled out by the grade teacher. Scholarship was to be entered on a scale of four: 1 for very good; 2, good; 3, fair. 4, poor. Vision is tested for acuity alone, using the usual Snellen chart at twenty feet. The number of lines above the unit line not read are noted. Tests for hyperopia were discussed, but it was decided to omit them until the examiners had acquired a year's experience. Moreover, there was considerable doubt expressed as to the value of any such test under the circumstances.

Under inflammation was comprehended any indication of soreness of eye or lid. Careful inquiry is made as to any history of aching eyes, frequent frontal or other headaches, and fatigue after reading or study, and record is made of any

noticeable deviations. Children wearing glasses are examined with the glasses in place and the use of them is noted.

Owing to the time required, second grade children were omitted later. It was found that many of them when asked to read the card, began to repeat the alphabet, and much time was consumed in making them understand what was wanted. I am under the impression that the frequency of this experience has a rather important significance of a scholastic nature, but there has been no opportunity as yet to investigate it.

In the examination of the hearing, children are required to repeat letters, words and numbers whispered at a distance of fifteen feet, one ear being closed. This is not very satisfactory. Many of the school buildings are located on street car lines and the noise incident thereto renders this test impossible except with great waste of time. The lack of a suitable room in many buildings renders this test nearly valueless. We shall attach very little significance to this item for statistical purposes. The presence of pus or odor is readily discerned.

Nasal obstruction is always noted whenever difficulty of free breathing through either nostril is noted, the lips and the other nostril being closed. Mouth breathing and the presence of unclean or bad teeth are readily detected by observation.

The examination completed, the card is returned to the teacher who notes in her register any item checked. She then sends to the parent or guardian a formal notice indicating the organs that are apparently defective. This notice urges immediate consultation with a physician and offers to give necessary information if needed in order to secure medical service. It is printed in six different languages—English, German, Italian, Bohemian, Hungarian and Polish.

After a reasonable time has expired, if nothing has been done for the child, a personal note is sent and an interview solicited and every effort is made to secure some definite action. Large numbers are glad to have their attention thus directed, many ignore it (either considering it of no importance, or denying its accuracy, or, being poor, feel that they cannot afford to do anything), others object to their children wearing glasses for instance or are afraid of an operation, or for other reasons refuse to have anything done. Still others violently resent the examination. This last group is quite insignificant in numbers but is not confined to any special class of the public.

Where parents are recalcitrant, and the condition of the child is serious, every possible influence is brought to bear, and when everything else fails, a recourse to the juvenile court is threatened. This always works. The court has authorized us to call upon it for a subpoena on the charge of "neglect" in all such cases. We have never had to have one issued.

Every effort is made to secure the right kind of assistance for those who are poor. Pauperization must be carefully guarded against. We have on the one hand a considerable number able to pay reasonable charges but ever ready to get something for nothing. On the other hand, a numerous group unable to pay ordinary charges but who do not want to become objects of charity. Between these is another group unable to pay and willing to continue in that state. The Associated Charities render excellent service in this connection and this is capable of great development. Parents are referred to the dispensaries and clinics only when they state, or it is discovered, that free service is a necessity. A number of oculists, aurists and other specialists and general practitioners have offered their services free and at reduced rates for cases which it does not seem desirable to send to the clinics or dispensaries.

In the matter of spectacles, the Board of Education has a contract with a reputable prescriptive optician whereby glasses are supplied at a very low rate and subject to the approval of the prescribing oculist. Children of indigent parents are sent to the Municipal Department of Charities and are supplied at the city's expense. During the last three or four months about forty children have been supplied through these two agencies. The city has also established a free dental clinic, where principals can make regular appointments for deserving children.

The examiner is in a building from two or three days to ten days or two weeks, depending on the size of the building. They are able to handle from one hundred to one hundred and fifty children in a day of five hours. During this time they take up with the teachers and principal and parents the more serious cases and press for immediate action, and are able to accomplish large results. Many cases of children, whose eyes are found defective, report that they have glasses but do not wear them. All such are excluded until they bring their glasses and wear them, and are sent back when they

forget them. Again they find many who have a desire to wear glasses and who try to secure a report of defectiveness. The personal education the examiners are able to give in relation to these and other matters, such as cleansing the teeth, has a force under these circumstances that can hardly be overestimated.

No statistics have as yet been compiled showing the conditions found or the results that have already accrued. We know, however, that the number of children wearing glasses has been increased by the hundred (I would almost say thousand), and hundreds have been treated for ear, nose and throat defects, as a direct result of these examinations.

During the fall we had the services of a special teacher who is a physician. He was detailed to the work of examining children reported mentally defective, epileptics, the deaf and the more serious cases of other defects. His report on leaving our city in December gives a slight indication of the definite results being secured under this confessedly unsatisfactory plan. (It must be remembered that all supervision of physical training, plays and games and inspection of ventilation, etc., was dropped entirely throughout this school year, except for the month of January, in order that this examination might be conducted.)

Dr. Fischer, now the Supervisor of Physical Training and School Hygiene of Indianapolis, reported as follows:

"In reporting bad eye, ear, nose and throat conditions to the parents, and insisting upon their being treated and improved, many interesting letters were received, and not a few stormy interviews held. Such a statement as 'Mind your own business, I'll take care of my children to suit myself,' was putting it mildly. In all cases, I maintained my position, and with the aid of the Truancy Department, the Juvenile Court, the Associated Charities, the various hospitals and physicians, I forced parents to do the proper thing to better the child's condition physically and mentally. Before beginning the work, I fortified myself with plenty of help. I put myself in communication with all the hospitals of the city, and asked them to give the children, sent by us, special care. Knowing the objections many people had to going to a hospital dispensary, I secured the services of six of our best specialists, all of whom promised to care for these children, free of charge, where the parents were unable to pay. In this way many bad

cases of eye trouble were attended to, sixteen cases of adenoids were operated on privately, and thirteen cases of ear suppuration and partial deafness are being treated at the present time."

* * * * * *

"The greatest opposition was encountered when I began to insist that the children afflicted with epilepsy be sent to the special school established by the Board. I kept at it, and today all epileptics are either at Brownell School or have gone to institutions where such cases are cared for. With the aid of Assistant Superintendent Muckley, I was enabled to send the bad cases of deafness to the deaf school. Several boys, who were habitual smokers and morally defective, were sent to the Boys' School."

* * * * * *

"In all, I visited seventy buildings, some of them several times. 308 children were reported defective. Of this number I examined 288, 74 being sent to the defective grades; 21 are still upon the waiting list because there is no room for them. This does not include the 19 children in the Broadway district. Eight cases of epilepsy were sent to the special grade at Brownell School, and 4 cases of deafness to the Deaf School. Nineteen cases of ear disease, 107 eye, and 127 nose and throat cases were examined and referred either to hospitals or private physicians for correction. The cases that I have reported are *only the bad ones,* and a *small percentage of those that really need looking after.* The other special teachers are also doing good work along these lines. I examined several cases of spinal curvature, and would suggest that next year more attention be placed upon the detection of these cases."

The Board of Education of Cleveland maintains ten classes for mental defectives, established since January, 1905, and serving upwards of 150 children, a school for the deaf with about fifty pupils, and a class for epileptics with eight pupils. Under the school code of Ohio, the Board has the authority to assign a pupil to such a class or school as, in its opinion, will best serve the educational interests of the school district. It is also empowered to employ such persons for the conduct of the schools as in its judgment are necessary. It also has power to levy its own taxes without review, up to the limit established by the state, and in addition to issue bonds up to

two per cent of the tax duplicate for certain purposes without popular vote, and for additional amounts subject to a referendum. Under these conditions it is believed that Cleveland has an opportunity to do the best things for its children above any other city. That the Board of Education is alive to this opportunity is evidenced by many things but by none more than the appointment of its President to serve with the President of the Board of Health and the Chairman of the Chamber of Commerce Committee on School Sanitation as a committee to work out a comprehensive and scientific plan and method for a Department of School Hygiene. This committee has appointed a sub-committee consisting of a physician from the Sanitation Committee of the Chamber of Commerce, a physician of the Board of Health, and the Supervisor of School Hygiene, the functions of which sub-committee are to define the problem and work out a tentative solution of the same. Members of the Board of Education have already expressed themselves as favoring a solution on a modern and scientific basis.

The following outline plan for a Department of School Hygiene, and its relation to the Board of Health, has been favorably considered:

A DEPARTMENT OF SCHOOL HYGIENE.

Four kinds of work to be done:

1. Prevention of communicable diseases.
2. Care of children physically and mentally defective.
3. Maintenance of a good hygienic environment.
4. Constructive measures—included under the general term "Physical Training" (Motor Education, Play as an Educative Factor, Development of Organic Power and Endurance, Increase of Vitality, Securing Good Posture, etc., etc.)

No. 1. Belongs exclusively to Board of Health.

No. 4. Belongs exclusively to Department of Hygiene and Physical Training.

No. 2. (A) Involves, primarily, the discovery of children requiring care.

(a) Mental defectives—(backwards, etc.).

(b) Physical Defectives—(1) eye, ear, nose, throat, teeth, cripples, etc., and (2) epileptics, choreics, anemics, etc.

(B) Their care involves—

(a) The separation of certain groups from the regular classes—mental defectives, the deaf, crippled, epileptics and blind, and the direct supervision of their attendance in school.

(b) The selection of cases, concerning some of whom only a recommendation of special medical or surgical care would be made to their parents, and of others for whom, under proper safeguards, such attention should be required. This involves the

(1) Co-operation of examiner, principal, teacher and parents;

(2) Following up and conferring with parents and family physician;

(3) Establishing relations with dispensaries, clinics, etc., and securing their services in all proper cases;

(4) Relationships with Associated Charities, the Juvenile Court and State Institutions; and

(5) Following all such cases throughout their school life.

This whole problem is so intimately bound up with all the school processes that it should be under the immediate direction and supervision of the Department of School Hygiene of the Board of Education.

It might be desirable to make the Director of the Department of School Hygiene a deputy of the Health Officer in order to establish a direct official relationship between the two Boards.

The appointment of a corps of School Physicians (12 to 15) by the Board of Education, in co-operation with the Special Teachers of Physical Training would handle all matters arising in No. 2 and No. 4. This would necessitate a clear definition of the work to be done by each Board so as to avoid unnecessary duplication. A medical assistant in the Department of Hygiene and Physical Training in this connection is absolutely essential whatever plan is adopted.

No. 3. The maintenance of a good hygienic environment includes:

(a) The establishment of hygienic standards;

(b) The detection and correction of present unhygienic conditions of lighting, heating, ventilating, sanitation, seating, cleaning, etc.;

(c) The supervision of the hygienic aspects of all new buildings, involving relations to architect, building committee, director and superintendent; and

(d) Supervision of the hygienic aspects of the school processes.

This aspect of the problem involves the legal power of the Board of Health to establish minimum "standards" and to require their maintenance. It involves the duty of the Board of Education to secure the maximum of quality and efficiency consistent with social economy.

The bare statement of this whole problem indicates the necessity of correlation of the two Boards in regard to it, and the arrangement suggested above might be the solution. There are many practical difficulties, but they are not insurmountable.

XXXVII.

TUBERCULOSIS OF THE MIDDLE EAR IN CHILDREN, WITH SPECIAL REFERENCE TO ITS OCCURRENCE AS A PRIMARY LESION.*

By Paul Mathews, M. D.

There are numerous considerations which combine to render tuberculosis of the middle ear and temporal bone a subject of great interest and importance, both clinically and pathologically. The number and variety of the channels through which infection may take place, the frequency of the condition, its occurrence in infants, the gravity of the condition and of its possible complications, the multiplicity and diversity of its signs and symptoms, the urgent necessity for drastic treatment, the possibility of absolute diagnosis and ultimate cure are the most important of these considerations.

Important as the subject undoubtedly is, it is only recently that much attention has been paid to it, and even now its frequency and gravity are not duly appreciated, nor are its signs and symptoms sufficiently detailed in the current text-books. Indeed, many of them (even of those dealing exclusively with diseases of the ear) pass it by altogether or treat it with a brevity it ill deserves.

Before discussing the question in detail, it is desirable that it should be understood that in the following paper the term "middle ear" will be held to include, not only the cavum tympani, but also the mastoid antrum and Eustachian tube. This is fully warranted by the anatomy and the developmental history of these cavities, as has been insisted upon by Young and Milligan (1). Owing to the difficulties in determining the primary site of the tuberculous process in these parts, it is convenient to consider tuberculosis of the middle ear together with tuberculosis of the temporal bone; for it is rare that cases of the former come under our notice before there is some involvement of the bone, and still less frequently do we encounter tuberculous caries of the temporal bone before the middle

*From the British Journal of Children's Diseases, Oct. and Nov., 1906.

ear has become affected, except in cases where a temporal caries —unsuspected during life—is revealed upon the post-mortem table. That the two conditions can, and do, arise separately scarcely permits of doubt, but it is inconvenient for purposes of practical diagnosis and treatment to disassociate the two conditions.

Although the condition does not yet receive full recognition of its importance, its occurrence has been recognized for many years. The association of chronic otorrhea with the scrofulous or strumous diathesis did not escape the observation of the physicians and surgeons of the early part of last century, and was insisted upon when the diseases of the ear became the subject of special study. In the absence of the evidence which we now regard as a *sine qua non* in the verification of the diagnosis of the condition, it is necessary that the cases described by early writers, and the conclusions they draw from them, should be accepted with considerable reserve. In discussing chronic otorrhea Wilde (2) states that in children it is to be regarded as indicative of the strumous taint, and notes its frequent association with scrofulous glands in the neck. He records many cases of chronic otitis media and caries of the temporal bone in association with lesions elsewhere of which we cannot doubt the tuberculous nature. There is obviously no reason why a patient suffering from a localized tuberculosis (*e. g.*, of the ankle or lung) should not also suffer from a non-tuberculous otitis media, and we must therefore be cautious, in the absence of conclusive evidence of the nature of the middle ear condition, in accepting such cases as examples of middle ear tuberculosis. Wilde gives notes, however, of a case which scarcely permits of doubt as to its tuberculous nature, viz. that of a child of nine, who for several years suffered from morbus coxæ, and in whom facial paralysis, preceded by chronic otorrhea, developed first on one side and then on the other, death finally supervening from "cerebral disease" (tuberculous meningitis?). Wilde also refers to the occurrence of otitis media in phthisis, and suggests that infection spreads *via* the Eustachian tubes. He draws attention to the painless character of the condition, a point of some diagnostic importance.

Tonybee (3) clearly associates many cases of chronic otitis media with tuberculosis. He gives notes of many cases in which "scrofulous matter" was found in the tympanic cavity,

but in most cases his notes are insufficient for our purpose. The following may, however, be accepted as genuine cases of tuberculosis of the middle ear or temporal bone:

1. A boy aged 4 years. Post-mortem examination revealed tuberculous meningitis, with a tuberculous deposit in the cerebrum. The tympanic cavity contained "scrofulous material."

2. A girl aged 1½ years. Post-mortem showed tuberculosis of the lungs and mesenteric glands. The temporal bone was carious; there had been otorrhea for seven months.

3. A girl aged 15 years. Post-mortem revealed tuberculosis of the lungs. The middle ear and mastoid were "scrofulous," and there was caries of the temporal bone. In life patient had had facial paralysis.

4. A man aged 44 years died from phthisis. Post-mortem revealed caries of the petrous temporal. In life he had otorrhea and partial facial paralysis.

He also mentions two cases in infants, aged 1 year and 4 months and 11 months, in whom there was long-standing otorrhea and "scrofulous glands in the neck." The condition of the viscera is not mentioned in the post-mortem notes of these two cases.

Other references to the condition are found in the writings of Nelaton, Rokitansky, and others.

From what precedes it will be seen that the condition was recognized many years ago, and many of the recorded cases, in spite of the absence of the conclusive evidence afforded by the detection of the tubercle bacillus, may be regarded as authentic.

The discovery of the bacillus tuberculosis by Koch in 1882 placed in our hands a means of diagnosing the condition with certainty. The bacillus was demonstrated in the aural discharge by Eschle (4) in 1883, and subsequently Nathan (5), and more recently Grimmer (6), Wingrave (8), Milligan (7), and others have demonstrated the frequency of its occurrence. The literature on the subject has grown apace, numerous cases have been recorded and analyzed, and the symptoms, etiology, and pathology have been elaborated by many observers.

In discussing the association of tuberculous otitis media with late phthisis, Wilde (2) suggested that the Eustachian tube was the avenue of infection of the tympanic cavity. This has largely been accepted as probable by subsequent observers; but

the occurrence of cases in which no pulmonary tuberculosis exists, and of cases in which the tuberculous process is confined to the temporal bone, point to the possibility of other channels of infection, and suggest that the tuberculous lesion in the middle ear may in some cases be primary, and not secondary to tuberculosis elsewhere. Many cases of primary tuberculosis of the middle ear or temporal bone have been recorded by Knapp (9), Goldstein (10), Williams (11), McCaw (12), Oppikofer (13), Jobson Horne (14), Hurd (15), and others. It is not intended to detail or to analyze these cases here; and the following cases are quoted briefly to indicate the nature of the condition of which they are typical.

1. Case recorded by Jobson Horne (14), a child aged 1½ years. History of wasting for seven months, with otorrhea for four months and cough for three months. When seen had had facial paralysis, otorrhea, and swelling behind ear due to subperiosteal abscess, which was incised, necrosed bone being found. The aural discharge contained tubercle bacilli. Death subsequently ensued from miliary tuberculosis.

2. Case reported by Hurd (15), child aged 1 year and 5 months. A swelling over the mastoid was lanced when patient was six months. The wound refused to heal, and later necrosis of the bone ensued. Microscopic examination of the granulation tissue showed evidence of tuberculosis. The child showed no signs of tuberculosis elsewhere.

3. Case reported by Knapp (9), child aged 5 years. Patient had tuberculosis of bone in the back, ankle, above right eye and below left eye. There was a granulating ulcer behind the right ear leading down to carious bone. There was no sign of disease of the external meatus or of the cavum tympani, the mastoid alone being affected.

4. Case reported by Oppikofer (13), child aged 6 months. Discharge from ear following measles. Patient had facial paralysis; the antrum contained pus; granulations from the caverna tympani showed tuberculous changes. Death occurred seven months later from general tuberculosis, the lungs, larynx, and meninges being affected.

An interesting case is recorded by Freysing (52), in which there were multiple tuberculous tumors on the skull, together with involvement of both tympanic membranes.

ETIOLOGY.

That the condition should occur not infrequently in late phthisis need not surprise us when we recollect the channels of infection. It is difficult, however, to estimate its frequency, and the published statistics differ widely. Thus Schwabach (16) found aural suppuration in eight cases out of 139 patients suffering from pulmonary tuberculosis. Moldenhauer (17) found seven cases of middle-ear suppuration in 294 cases of tuberculosis (pulmonary and otherwise). Carr (18) in 120 post-mortem examinations on children dying of tuberculosis found the middle ear and temporal bone tuberculous in three cases. Price-Jones (53) in twenty-one cases of tuberculosis in children (examined post-mortem) found it in two cases. Still higher figures have been published. Thus Still (19) in the post-mortem examination of 269 tuberculous children found the middle ear tuberculous in fifteen, and of these he regarded the aural condition as primary in no less than nine. In a series of twenty-five post-mortem examinations of tuberculous subjects at the Newcastle Sick Children's Hospital, the writer (44) found evidence of the condition in the middle ear or temporal bone in seven cases, in two of which it was unsuspected during life.

Whilst it has been shown that middle-ear tuberculosis is more frequently a complication of phthisis with cavitation than of any other form of pulmonary tuberculosis, it is also a well-established fact that in children cavitation occurs with much less frequency than in adults; indeed, it rarely occurs in patients under seven, and in infancy is almost a pathologic curiosity. Under these circumstances we should expect to find tuberculosis of the middle ear less frequent in infancy than in adult life were its occurrence dependent on infection from pulmonary tuberculosis. The very reverse, however, is the case. Tuberculosis of the middle ear occurs more frequently during infancy than in any other period of life. Indeed, after the third or fourth year its frequency undergoes marked diminution, and except as a complication of late phthisis it is subsequently a rare affection. Its frequency in infancy is well shown by Whitehead (22), who analyzing 100 consecutive fatal cases of middle-ear disease, found that 12 were cases of tuberculosis of the middle ear, and of these no less than nine occurred in children under two years of age, and in eight of these the aural condition appeared to be primary.

It has been maintained by Horne, Grimmer, and Milligan that the condition is not infrequently primary in infants, an hypothesis well sustained by the figures quoted above. It has been stated by Milligan (21), that of his hospital patients under six years of age suffering from suppurative otitis media, between 50 and 60 per cent. suffer from tuberculosis of the middle ear.

The fact that the tympanic condition may be primary must not be overlooked in considering the etiology of the condition.

Tuberculosis in infants and children is, unfortunately, only too frequent, and it has largely been ascribed to invasion through the lymphatics of the alimentary tract, from which the milk of tuberculous cows has largely been assumed to be the vehicle of infection. It is even asserted by Nathan Raw (54) that this is the almost invariable mode of invasion in infants. It must not be forgotten, however, that so far as bacteriology is concerned the middle ear is to be regarded as a portion of the upper respiratory tract, as has been emphasized by Goldstein (10) and others. If tuberculosis of the middle ear, then, is primary it must be regarded as a case of "respiratory" rather than "alimentary" tuberculosis. The fact that the patients are most frequently infants, and that they are derived from a class who are not largely fed on cow's milk, lends support to the view that infection is *via* the upper respiratory rather than the alimentary tract. It has been pointed out by Milligan that the condition is much more frequent in hospital patients than in children of the upper classes. No doubt unhygienic conditions and overcrowding are important factors, nor must we overlook the importance of the presence of tuberculosis in other members of the family, with whom patient may be in constant contact. Of our own series six had a family history of tuberculosis. As regards the infection from cow's milk, it is interesting to know that of the five cases under one year of age three were breast-fed entirely until admission to hospital, and one had been fed entirely on patent foods.

The occurrence of the condition in cases of tuberculosis involving organs has been studied by many observers. It is stated to occur with greatest frequency late in phthisis, when the sputum is most abundant and most likely to remain near the pharyngeal openings of the Eustachian tubes, owing to

the diminution of the patient's expectorating power—*i. e.*, when the chances of infection via the Eustachian tubes are at a maximum. Politzer (23) has shown that infection may arise during the last few days of life. It may, indeed, be merely a part of a general tuberculosis which closes the scene. Brieger (24) and Milligan (21) state that the middle ear is more liable to be infected secondarily to pulmonary tuberculosis than to tuberculosis elsewhere.

CHANNELS OF INFECTION.

To produce tuberculous lesions in the middle ear or temporal bone it is necessary for the bacillus to gain access to these parts, and this it may do by one or other of several channels, which are:

1. By the air passing up the Eustachian tubes and mechanically conveying the bacilli to some part of the middle ear.
2. By infection spreading up to the cavum or antrum via the Eustachian mucosa.
3. By infection spreading via the lymphatics from lesions elsewhere.
4. By infection carried by the blood-stream from tuberculous lesions elsewhere.
5. By infection from the external ear.

The first-named method may at first sight appear improbable. We cannot, however, dismiss it without first duly considering the factors which may influence its occurrence.

The general anatomy of the Eustachian tube is so well known that it is unnecessary to enter into its details here. Certain facts, however, may profitably be reviewed in order that we may fully appreciate the possibilities of this line of infection. In the adult the tube is from 34 to 36 mm. in length, but in children it is much shorter, being, indeed, in the newborn infant less than 20 mm. in length. Its width is comparatively (and it is even stated by Eitelberg actually) greater than in adults. Hence any object lodging in the tube is more liable to be removed by currents of air in children than in adults. In children, too, the tympanic orifice lies lower, and is comparatively larger than in adults, and the pharyngeal orifice much nearer to the choanae, and therefore to the currents of air by which air-borne bacilli may enter. It has been shown by Young and Milligan (1) that smoke insufflated

into the Eustachian tube passes directly through the cavum tympani into the antrum, and that air-borne bacilli may similarly gain entrance to the antrum is by no means inconceivable. It is true that the bacilli will in the majority of cases tend to alight on the Eustachian mucosa and be removed from thence by the cilia lining it, but in the short, wide tube of infants the possibility of the bacilli being driven beyond the tympanic orifice by the strong blasts of air produced by efforts such as sneezing, coughing, etc., is greater.

Even in adults particles much larger than bacilli may thus gain entrance, as is proved by the case reported by Haug (25), in which particles of snuff gained access to the cavum by this method, and there set up a purulent otitis media. Similarly, it is not impossible that minute particles of food may be mechanically insufflated into the tympanic cavity by the act of choking or vomiting, and thus convey the bacilli into the cavity of the middle ear. It has been suggested by Milligan (26) that the movements of sucking initiate currents of air along the Eustachian tubes, and thus help to account for the frequency of the condition in infancy.

In the production of the condition in late phthisis this method again appears probable. In the wasted condition of advanced pulmonary tuberculosis, the tissues surrounding the tubes are shrunken and atrophied, and the lumen of the tube becomes wider than in health—Haberman (27). It has been shown by Jobson Horne that aural tuberculosis is much more frequent as a complication of pulmonary tuberculosis when there is cavitation than when the pulmonary lesions are miliary in type. The frequent coughing and the abundant sputum also render it likely that particles of sputum laden with bacilli may be driven through the tube into the cavum tympani. It is at least suggestive that the condition should be so frequent in late phthisis and in early childhood, when the conditions favoring this mode of infection are at their maximum.

The second method, viz., *invasion by spreading of the tuberculous processes along the Eustachian tube,* is subject to the same conditions as the first, and would appear to be of more frequent occurrence. The two methods are so closely connected that we cannot entirely dissociate them. It is important to remember that the middle ear should be regarded as a part of the upper respiratory tract, as has been insisted upon by Jobson Horne (28) and Goldstein (10). The latter

states that "over 70 per cent. of the inflammatory and infectious processes which involve the ear have their origin in the pharyngeal and naso-pharyngeal cavities." Politzer also regards this line of invasion as the most frequent.

While tubercle bacilli driven into the tympanic cavity tend to remain there, there is a greater probability of them being removed from the Eustachian tube by the ciliary movement should they chance to alight on the Eustachian mucosa. Hence it follows that while there is a greater possibility of bacilli gaining access to the Eustachian mucosa, there is also a greater probability of them being removed before inciting tuberculous changes. It is possible, however, that under favorable circumstances the bacilli may pass through the mucosa, without producing in it any lesion, to the lymphoid follicles which have been seen and described by Gerlach in the mucosa lining the tubes in children.

The probability of tuberculosis originating in this manner is enhanced by the occurrence of catarrhal changes such as are frequently produced in the exanthemata, etc. Politzer (23) has frequently seen tuberculosis of the middle ear, associated with enlargement of the cervical glands, following on an attack of scarlet fever.

In addition to the exposure of the orifices of the tubes to the inspired air, whereby air-borne bacilli may reach the Eustachian tubes, there is also danger of infection of the tubes by spread of tuberculosis from adjacent structures. Primary tuberculosis of the nose and of the pharynx are both rare except as complications of late phthisis, and the chances of infection from these areas appear to be remote; we must not forget, however, that the presence of excessive adenoid tissue in close proximity to the openings of the tubes introduces another factor of considerable importance.

The frequency with which "adenoids" are subject to tuberculosis has been variously stated by different authors. Thus McBride and Turner, examining adenoids removed from 100 patients, found evidence of tuberculosis in only three cases (a figure which they admit is probable an underestimate). Pilliet (30) found tuberculosis in three cases out of forty (7.5 per cent.). Dieulafoy (31) in thirty-five cases found tuberculosis in seven (20 per cent.). Brindel (32) found evidence of tuberculosis in eight cases out of sixty-four (12.5 per cent.); Gottstein (33) in four cases out of thirty-three (12 per cent.):

Pfluder and Fischer (34) in five cases out of thirty-two (15.6 per cent.); Milligan (35) found it in 16 per cent., as also did Lartigan and Nicol (61). To obtain the above estimate, histologic and inoculation methods were employed. It is interesting to note that the most exact method—inoculation—gave the highest figure (Dieulafoy, 20 per cent.). It will be seen that "adenoids" are by no means infrequently the seat of tuberculous changes, and their presence may be an important factor in producing tuberculosis of the middle ear.

The third method of infection, viz. *via the lymph-current* from the glands, can occur only by extension against the lymph-stream from the glands through which the lymphatics of this area pass. Such extension has been shown to occur elsewhere, and we must accept its possibility in this case. Unfortunately, the lymphatics of this area are not well determined, and our knowledge of their anatomy is very imperfect. Poirier and Cuneo (36) affirm that the lymphatics of the cavum tympani originate in a network from which branches run to the retropharyngeal glands, which also receive afferents from the Eustachian tube. These glands are two in number on each side, and lie behind the pharynx, in front of the lateral masses of the atlas. In addition to draining the middle ear, these glands receive afferents from the pharynx (in its upper part), and from the nasal fossae. Efferents run to the superior cervical glands lying alongside the internal jugular vein. It will be seen that these glands drain an area which is much exposed to bacterial invasion. When we recollect the frequency of posterior rhinitis, pharyngitis, and Eustachian catarrh occurring in the exanthemata, or as part of ordinary "colds," we are not surprised at the occurrence of inflammation of these glands. Clinically, however, we find that this rarely occurs except in infants and young children, and it is even stated that these glands undergo spontaneous atrophy towards the close of the third year (62). Prior to this, suppuration in them not infrequently occurs, and is the most frequent cause at this age of retropharyngeal abscess.

The wide area drained through these glands renders it difficult for us to appreciate the frequency with which Eustachian and tympanic infections are the cause of their enlargement. We must not forget, however, the possibility of the middle ear and its adnexa being infected secondarily to tuberculosis of these glands, the original seat of invasion possibly lying in the nasal or pharyngeal mucosa.

The association of tuberculosis of the middle ear with lesions of these glands is suggested by the age-incidence of the two conditions.

Clinically, tuberculosis of the middle ear is often associated with enlargement of the lymph-glands lying over the mastoid process and also with those in the superior cervical chains. Indeed, early involvement of these glands in the course of chronic otitis media has been held by Grimmer, Milligan, and others to be indicative of the tuberculous nature of the middle ear conditions.

Infection through the blood-stream from a focus more or less remote is of the utmost importance. Barnich (37) has shown that this method occurs most frequently when the lesion from which infection takes place is situated in some part of the osseous or glandular system. It is precisely these two forms of tuberculosis which are most frequent at the age at which tuberculosis of the middle ear most frequently occurs. Such a mode of extension implies that the condition may not of necessity begin in the tympanic mucosa itself. In fact, cases originating in this manner in all probability usually arise as an osteomyelitis of the pars mastoidea or pars petrosa of the temporal bone, and involve the middle ear by extension. Such a method would fully explain the occurrence of cases in which the pars mastoidea is extensively affected while the tympanic cavity remains unaffected, though such cases may conceivably arise through the infection of the antrum through the Eustachian tube.

There are many phenomena associated with the condition which favor this mode of origin. The age-incidence is important, for it is undoubted that blood-infections are more frequent in childhood and infancy than later in life, as also are tuberculous affections of the bones. It can be shown that not only is tuberculosis of the osseous system more frequent in early life, but also that certain bones are more frequently affected at certain ages than at others. Thus dactylitis is most frequent during the first three years of life. During a year at the Newcastle Sick Children's Hospital, fifteen cases of spinal caries were admitted for treatment. In twelve of these cases the caries affected the lower cervical or upper dorsal spine, and all these patients were between two and five years of age. The other three patients were older and in them the caries affected the lower dorsal or lumbar spine. To generalize

on such small numbers would be to court fallacy, but these figures were supported by the out-patient statistics. Without pressing the point too far, it may be possible that the occurrence of such a large majority of so-called "primary" cases of tuberculosis of the mastoid in the first and second years of life may depend upon, or be associated with, a similar predilection.

In this connection it may be mentioned that the stapes is more frequently affected in tuberculous than in any other form of middle-ear inflammation. The ossicle develops round the stapedial artery, which, usually atrophies and disappears towards the close of pregnancy; not infrequently, however, it persists some two or three years after birth, and may thus be the means of carrying blood-borne bacilli to the middle ear. In addition to the age-incidence the occurrence of extensive caries is of importance. Many cases when first observed show extensive caries of the temporal bone, a fact which might be ascribed to the absence of symptoms produced by the condition until by extension the tympanic cavity becomes infected. Milligan is of opinion that the osteomyelitis tends to remain as such until secondary septic processes arise in the cavum tympani or antrum. Cornet (38), on the other hand, thinks that caries of the temporal bone is generally secondary to infection of the tympanic cavity.

Associated with this early and extensive caries is facial paralysis, which may be the first indication of the condition.

That such a mode of infection exists permits of no doubt. The case reported by Knapp (9) is undoubtedly of this nature, as also in all probability the cases quoted above from Wilde (2) and Hurd (15). The occurrence of tuberculous deposits in this region in acute miliary tuberculosis has been observed, but it is of no practical importance.

The establishment of tuberculosis of the middle ear by *invasion from the external meatus* may occur, but is probably of rare occurrence. In cases where the drum has been perforated it is not impossible that the introduction of foreign bodies into the meatus may be the means of introducing bacilli into the middle ear.

Examination of these methods shows that each is possible. Practically the cases will tend to fall under one of two headings:

1. Cases in which the middle ear has been infected through the Eustachian tube or the air passing up it, such cases including those in which phthisis pre-exists, and also the true cases of primary tuberculosis of the middle ear. From what precedes it may be stated that the occurrence of the latter is greatly favored by the conditions which obtain in infancy, during which period such cases are more frequent than at any other period of life.

2. Cases in which the lesion is due to blood-infection, the mucosa of the middle ear or the temporal bone being the site of the lesion. Such cases include most of the so-called "primary tuberculous mastoiditis," etc. It has already been shown that such cases are most likely to occur in infancy owing to the increased frequency of bone-tuberculosis and of blood-infection during that period.

PATHOLOGY.

The tubercle bacilli, having gained access to the middle ear by any of the above routes, there give rise to the changes characteristic of tuberculosis. These changes have been described by Politzer, who examined histologically the mucosa lining the tympanum of a woman who died from phthisis complicated by otitis media. In this case the mucosa was largely destroyed and the bone extensively affected. Habermann (39) examined thirteen cases, and found all degrees of the condition from early infiltration down to extensive destruction of the temporal bone, and the researches of Barnich (37) and of Schwabach have extended our knowledge of the progress of the condition.

The changes induced differ somewhat according as the condition runs an acute or a chronic course. In the acute form there is rapid loss of tissue, consequent upon the ulceration of the tubercles, which are deposited in large numbers. This leads to perforation of the membrana and rapid formation of granulation-tissue. Occasionally the primary grey tubercles are visible on the membrana, in which situation they are not infrequently multiple, and Milligan (35) has been able to see them on the inner wall of the cavum through a semitransparent membrana. Although they so soon lead to perforation of the drum, they have been described by Politzer, prior to this, as pearly grey spots, with sharply-defined outline, and with little surrounding inflammation, though in some cases the whole

drum may assume a pink tint. As already stated, they rapidly lead to perforation, and if they are multiple they may by coalescence form a single perforation, or they may remain discrete. The occurrence of mutiple perforations is a point of considerable diagnostic importance. Owing to the occurrence of perforation, and to other causes, it is usual for septic and putrefactive organisms to gain entrance and to speedily modify the pathologic processes.

While the acute form is a well-established entity, it is more usual for the condition to run a chronic course, and it is this chronic tuberculosis which presents the most typical picture. Owing to the intimate connection between the temporal bone and the tympanic mucosa—the deeper layers of which fulfil the functions of periosteum to the subjacent bone—the occurrence of tuberculous changes in the mucosa early leads to tuberculous infection of the bone, in which a cario-necrotic change is instituted. The process of the ulceration of the tubercles in the mucosa, leading to caries in the bone, has been fully described by Milligan. The caries progresses rapidly, and, as in tuberculous caries elsewhere, is not productive of much pain.

The reaction of the tissues excited by this chronic tuberculosis is not intense; and hence, instead of the hyperemic mucosa associated with an acute otitis, we find pale, ulcerated mucous membrane with profuse flabby granulations, which fill the cavum, and may even project through the perforated drum and form polypoidal masses in the external meatus. These granulations may show typical tuberculous changes, such as giant-cell formation, caseation, etc., as has been observed by Hurd and Milligan.

The caries extends steadily, and encounters no bar to its progress until dura mater or periosteum is reached. The dura is rarely perforated, but tends, as in Cases 2 and 10, to become thickened over the underlying caries.

The extension of the caries is of great importance in the production of complications, which may arise from implication of structures within the temporal bone. Thus the extension to the Fallopian aqueduct may cause facial paralysis, at first partial (from neuritis) and finally complete (from destruction of the seventh nerve). The production of this complication is favored in infancy by the incomplete ossification of the walls of the aqueduct, which do not offer so much resistance to the

disintegrating processes as they do when ossification is complete. Similarly, the labyrinth may be affected, and complete nerve-deafness, or—by involvement of the semicircular canals—persistent vertigo ensue.

Caries of the ossicles occurs with considerable frequency. In no other middle-ear condition are the ossicles so frequently destroyed. Caries of the foot of the stapes is considered by Haike (40) to be pathognomonic of tuberculosis. If this occurs the fenestra ovalis is soon destroyed, and the labyrinth thus becomes involved. Perforation of one or other of the fenestrae has been stated to occur in 33 per cent. of cases (35). Mention has already been made of the possibility of the stapes being principally infected in early infancy.

Although the bony changes are usually of the nature of a gradual disintegration, necrotic changes may occur and large sequestra be exfoliated, as in a case described by Goldstein (10).

In addition to the involvement of the nervous apparatus blood-vessels may be eroded and hemorrhage occur. Kössel (41) has described a case in which thrombosis of the lateral sinus was produced. A similar case (No. 6) is included in our series, but in this case there is reason to believe that the thrombosis was due to a septic organism rather than to the tubercle bacillus, though the latter was also present in the middle ear. Cheatle (55) has pointed out the importance of the petrosquamosal sinus as a channel of infection from the middle ear, and records a case in which miliary tuberculosis was so produced.

The occurrence of mastoiditis is not infrequent, and, as has been shown by Knapp, Hurd, Jobson Horne, and others, the antrum may be extensively affected before the cavum shows any signs of the condition. This appears more likely in such cases as the condition commences as an osteomyelitis of the pars mastoidea, but does not entirely depend on this mode of origin, as it has been shown by Young and Milligan that in cases of infection through the Eustachian tube mastoiditis may occur independently of inflammation of the cavum tympani.

Owing to the early perforation of the drum other organisms gain access and alter the course of the tuberculosis. Hence it is difficult to follow the later changes of the condition. The invasion of other organisms introduces a further difficulty in diagnosis, for the tubercle bacilli are apt to be disintegrated

and destroyed in the profuse discharge which is associated with the presence of putrefactive organisms. Hence the great difficulty in detecting the bacilli in stained films of the discharge in which they are never abundant, except in some acute cases.

The presence of tubercle bacilli in the middle ear soon leads to enlargement of the neighboring lymph-glands, in which the chronic inflammatory changes of tuberculosis—viz. formation of tubercles, giant-cell formation, and caseation—occur. These changes appear clinically to be usually first produced in the mastoid glands, from which subsequently the deep glands of the neck are infected. Glands in the parotid region may also be affected, as in Case 11, and the retropharyngeal glands are also liable to infection. In the present series they were enlarged sufficiently to cause symptoms in one case only (No. 3), but whether the glandular condition was secondary to the middle-ear condition in this case cannot be determined with certainty, for the tuberculous condition of the ear was only discovered post-mortem some months after the retropharyngeal glands became enlarged.

It is affirmed by Jobson Horne (42) that early glandular enlargement occurs in primary tuberculous conditions of the middle ear, but that the glands rarely become involved in cases where the condition of the ear is secondary to tuberculosis elsewhere.

Infection of the meninges is not infrequent as a complication which may ultimately cause death. Macewen (43) alludes to ten cases in which it occurred, in five of which the internal auditory meatus formed the line of infection. He has also found it produced by miliary tuberculosis, resulting from infection of the lateral sinus. Owing to the late union of the petrous and mastoid portions of the temporal bone, meningeal infection is more likely to occur in infancy than later. Not infrequently the meningeal condition is merely a part of a general miliary tuberculosis caused by blood-infection, to which infants during the second year of life are so prone. In the present series generally miliary tuberculosis was the cause of death in four cases (Nos. 1, 2, 3, 10), while meningitis only occurred in one (No. 5), in which case, unfortunately, permission for post-mortem examination was not obtained.

Mention is frequently made throughout the literature of this complication, and cases in which it has occurred are recorded

by Wilde, Milligan, Oppikofer, and numerous others. Horne states that this complication is not infrequent in cases of primary tuberculosis of the ear, but that its occurrence in cases where the tuberculosis of the middle ear is secondary is uncommon. On the other hand, it is affirmed by Politzer (23) that intracranial complications are less frequent in tuberculosis than in any other form of chronic middle-ear infection.

The occurrence of intracranial abscess is rarely seen. In the present series intracranial complications occurred in two cases only (Nos. 5, 6), in one of which there is reason to believe that this complication was associated with the presence of streptococci. Wingrave (56) has recorded an interesting case in which optic neuritis was produced.

The extension of the carious process in the other direction often leads to the formation of subperiosteal caseation and abscess formation. If the pars mastoidea be affected this may occur just over the antrum, or by extension inwards Bezold's perforation may ensue. On cutting down over the swelling in such cases, a fistulous track filled with unhealthy granulations and caseous *debris* and leading down to the antrum is found, as in Cases 1, 2, 3, 9 and 10. If left untreated these mastoid abscesses may burst through the skin, leaving a chronic indolent fistula, showing no signs of healing.

The fact that the Eustachian tube is shorter and wider in infants than in adults, and that the tympanic orifice lies lower and is of larger size, increases the probability of the thin, sanious discharge draining from the middle ear into the pharynx, from whence it may be swallowed and so convey bacilli to the lower alimentary tract. This may account for the frequency of the occurrence of enteritis as a complication, to which Milligan (57) has drawn attention. Such a condition would account for the frequency of diarrhea in these patients, though such a symptom may in many cases be due to general conditions rather than to local tuberculous inflammation.

While it will be seen that the complications which may occur are many, it is doubtful if the condition ever undergoes spontaneous cure. Politzer even casts doubt on the authenticity of cases reported as cured by operative interference. While it appears doubtful that cases occurring in late phthisis should be curable, it is not impossible that some primary cases may be cured by operation. It must be remembered that these cases occur at any stage when rapid and widespread dissemination of

tuberculosis occurs, and it is impossible in many cases to be certain that the aural condition is the only existing focus of infection. Indeed, owing to the slowness with which the condition declares itself, and the asthenic character of the inflammatory processes induced by it, it is probably infrequent that such cases come under observation before such dissemination has already occurred.

SYMPTOMS.

The symptoms produced by the condition are numerous and varied. In considering them it will be advisable to deal separately with the general symptoms and with those which are dependent on local conditions. The general symptoms are, broadly speaking, those of tuberculosis generally. It is remarkable, however, that these may be absent in some cases where the local disease is extensive. Amongst the most prominent of the signs and symptoms must be placed *wasting*. Not infrequently this may have been noticed some time before the local condition declares itself, and in some cases the patient is originally brought to a physician for the relief of this symptom. While the wasting process may be extensive, it must be admitted that many cases are seen in which general nutrition is good throughout (see No. 12). It is not improbable that the wasting is most marked in cases where the tuberculosis is generalized and where there is more than one focus of disease (see Cases 7 and 9); at the same time, it has been met with to a marked degree where the aural condition is primary, and where dissemination occurs only in the final stage of the condition (see Cases 1 and 10). We have no reason to doubt that the symptom is due to the general effect on nutrition caused by the absorption of the tuberculous toxin rather than to any local factor.

In some cases this wasting is augmented, if not caused, by the occurrence of intractable *diarrhœa*. This appeared in some of Milligan's cases and was well marked in Case 1 of the present series. It may occur at any stage of the condition, though from its nature it is more likely to be a terminal event. The *appearance of the patient* is in many cases suggestive of tuberculous mischief. The dryness of the skin which is so frequently noticed in tuberculous peritonitis, etc., is in many cases very marked, and cannot in every case be accounted for by the occurrence of diarrhea.

The presence of *rashes* on the skin has not, apparently, been noticed by other observers, and if present it is improbable that they are due to the local condition but rather to a general toxemic state. One case (No. 1) of the present series developed, a few days before death, a general erythematous rash, lasting for a day or two and then subsiding. It was followed by severe diarrhea, and on post-mortem examination miliary tubercles were found in the lungs and spleen.

In two cases of the present series (Nos. 2 and 9) scattered petechial hemorrhages occurred in the skin. They were few in number, occurred irregularly, and showed no typical distribution. In both cases they were seen several weeks before death and in only one case was there miliary tuberculosis. In both cases there were caseating tubercles in the spleen. In Case 2 these spots were noticed two months before death, and there was a large eruption of fresh hemorrhagic spots a few days prior to death. The occurrence of these spots cannot have any causal association with the aural condition, but seems to depend, as indicated by the splenic condition, upon some hemic condition caused by the dissemination of the tuberculous virus, and as such their occurrence in cases of tuberculous otitis has a grave significance.

The *temperature* chart of a patient suffering from aural tuberculosis displays nothing that can be recognized as typical. In cases uncomplicated by tuberculosis of other organs there may be little or no rise of temperature, as might be expected when we recollect the asthenic character of the condition. The presence of other organisms, however, tends to cause elevation and irregularity of the temperature. In cases where miliary dissemination supervenes we may see evidence of its occurrence in rapid alteration of the type of the temperature curve. In cases where there is extensive caseating tubercle, either locally or in some other organ, the typical swinging temperature may be observed, particularly where there are numerous foci. Some primary cases display marked variations in temperature.

Consideration of the pathologic processes involved, and of the complications to which the patient is liable, give many indications of the symptoms which we may expect in this condition. In acute cases the symptoms are those of an acute otitis media, and nothing pathognomonic is noticed for some time; and it is frequently not until the condition has entered

a chronic stage that suspicion is aroused by enlargement of the lymph-glands, facial paralysis, etc. In chronic cases the essentially asthenic nature of the processes fully account for the *absence of pain,* from which the patient is usually free. This absence has been commented upon by every one who has studied the condition. It has been suggested by Urban Pritchard (45) that this absence of pain can be accounted for by the lack of pressure on the nerves, the early perforation of the drum preventing the occurrence of increased tension in the cavum tympani. On the other hand, it has been suggested by Jobson Horne (42) that the absence of pain is due to the anesthetic action exerted by the decomposition products of the waxy envelopes of the bacilli themselves. The absence of pain is not peculiar to this condition, but is found in tuberculous osteomyelitis of any bone prior to the involvement of surrounding structures or the advent of mixed infection.

The occurrence of *discharge from the ear* is not infrequently —in the absence of pain—the earliest symptom noticed. This discharge presents many points, apart from its mere chronicity and the absence of associated pain, which may justly raise suspicion that the case is tuberculous. In many cases the discharge is thin and sanious—especially when the caries of the bone has been established. In some cases the discharge is flocculent and thick; in almost all cases it has a most offensive odor, from the presence of putrefactive organisms which gain access subsequently to the perforation of the membrana. If caries is present the discharge has a peculiar odor, which is easily recognized. Not infrequently the discharge is blood-stained and as this character is generally associated with the existence of caries, it usually persists when it once obtains. In some cases the discharge feels gritty from the presence of small spicules of bone, and a case in which it contained distinct bony sequestra which had been exfoliated has been recorded by Goldstein (10).

It has already been mentioned that ulceration of the tubercles early leads to *perforation of the drum.* This usually occurs early in the condition, and is not infrequently present when the patient is first seen. Owing to the frequent multiplicity of the tubercles it is not infrequent for the perforation to be multiple, as has been described by Politzer (23), Grimmer (6), Milligan (35), etc. By an extension of the ulceration the perforations may coalesce and produce a single perforation of large size;

indeed, it is nothing unusual to see the membrana almost entirely destroyed (see Cases 2, 5, 10, 11, 7). In addition to the multiplicity of the perforations, their position and appearance may be characteristic. Thus Blake and Buck (46) regard the presence of perforation in the posterior superior quadrant as almost pathognomonic of tuberculosis. The perforations are not usually surrounded by any marked zone of inflammatory redness, for, as has been pointed out, the process is essentially asthenic.

Through the perforations in the drum, *granulation tissue* may be seen. These granulations are more marked than in any other form of otitis media.

In many cases they have been seen to almost completely fill the cavum tympani. They are flabby and unhealthy, and readily bleed. From them sanious, foul-smelling discharge issues. They frequently show evidence of active tuberculosis, and caseous areas have been seen in them by Milligan (35) and Hurd (15).

The early *occurrence of caries* has already been mentioned. In such cases, as the processes commence as an osteomyelitis, it may be very extensive when the patient is first seen; indeed, in some cases the mastoid and petrous portions of the temporal bone may be reduced to a mere shell of bone, as in Cases 5 and 10. Milligan (35) has described a case in which this occurred on both sides, a thin lamina of bone supporting the middle cranial fossa being all that remained of the temporal bones. In many cases the carious condition is so obvious that it requires little demonstration. Though usually covered by granulation tissue, this is not always the case, and carious bone may be actually visible through the external meatus. A probe passed carefully into the cavum will frequently reveal the gritty, sugary nature of the bone beneath the easily-torn granulations. In advanced cases a probe so passed may not meet with any obstruction until the apex of the petrosa is reached. Thus in Case 10 a probe could be passed in horizontally for a distance of more than two inches from the external meatus before carious bone was touched. The caries may affect the ossicles, as has been already mentioned, and they may be completely destroyed, or become detached and be discharged. In many cases—particularly where there has been an osteomyelitis of the pars mastoidea—the caries involves the outer wall of the antrum and leads to the formation of a subperiosteal abscess

over the mastoid. Should this burst externally a fistulous track may be left.

The production of *facial paralysis* is easily understood when we recollect the course taken by the seventh cranial nerve in traversing the temporal bone. Seeing that the process producing the paralysis is itself usually of a chronic nature, it might be expected that the paralysis itself would occur gradually. This, however, is not always the case; often the paralysis comes on quite suddenly, as in Cases 5, 2. In such cases the paralysis is usually complete, but is not invariably so. Even though the facial nerve be affected in the aqueduct some of its fibres may escape. In a case observed by the writer in an infant of four months old there was slight paresis of the orbicularis palpebrarum on the right side, but no other evidence of facial involvement. Post-mortem examination showed the presence of caries of the right temporal bone, the facial nerve traversing the caries apparently intact. The tuberculous nature of this case could not be demonstrated, and the case is not included in our series, but that a tuberculous caries might similarly produce partial facial paralysis may be accepted as highly probable. The absence of lines in an infant's face sometimes makes it difficult to detect slight degrees of facial paralysis, as it is not manifest during repose. Its presence had not been noticed by the guardian of Case 7, in which it was nearly complete. The involvement of the seventh nerve in the aqueduct also leads, by implication of the fibres supplying the chorda tympani, to impairment of the sense of taste. It is obvious that this symptom is of little value in cases occurring in infancy, though it has been observed by Politzer in adults.

The *labyrinthine symptoms* are important, though not pathognomonic, and their production will be readily understood from the consideration of the pathological processes. Owing to the existence of caries bone conduction of sound is early impaired. The inner ear is liable to infection, not only by extension of the caries, but also—in an especial degree—by invasion through one or other of the fenestræ. The frequency of the involvement of the stapes predisposes to this. It is stated (35) that perforation of one or other of the fenestræ occurs in 33 per cent. of all cases. The involvement of the internal ear quickly leads to nerve-deafness, which is frequently absolute. The high degree of deafness in tuberculous middle-ear disease has been pointed out by Horne (28) and Milligan (35).

The occurrence of nerve deafness from involvement of the eighth cranial nerve, or cochlea, becomes of grave significance when we recollect that in five of Macewen's cases this was the path by which the meninges were affected.

The last symptom to which attention is drawn—*enlargement of the lymph-glands*—is certainly not the least important. The glands most usually involved are the mastoid, parotid, and retropharyngeal. Subsequently the deep glands of the neck become involved, and may form very large masses, as in Cases 1, 2, 7, 10, 3. It is important to note that these glands may be considerably enlarged before the middle-ear condition manifests itself by otorrhea, facial paralysis, or other symptoms, and, indeed, the presence of large glandular masses in the neck may be the first indication of any departure from health (as in Cases 1, 2).

The early enlargement of glands is the rule in tuberculous cases, and Milligan (35) states that it is rare to see cases without this symptom. According to Jobson Horne (42), the glands are rarely affected in cases when the ear is affected secondarily to other lesions, but their enlargement is a constant feature of primary affections of the ear.

DIAGNOSIS.

In discussing the symptoms it will be seen that these are not peculiar to the condition under consideration. It is important, therefore, that we should endeavor to appreciate the relative value of these symptoms in order that they may enable us to arrive at the diagnosis. Whilst the symptoms are of doubtful value individually, collectively they build up a picture which cannot easily be mistaken. It frequently happens, however, that the picture is not sufficiently complete until the patient is "the mere despair of surgery," and it is, therefore, necessary to see what symptoms are of special diagnostic significance in order that appropriate steps may be taken to eliminate the disease early in its course.

The multiplicity of perforations, the absence of inflammation surrounding them, and particularly their presence in the posterior superior quadrant—Blake and Buck (46)—have been emphasized as of special importance. In some cases tubercles have actually been seen on the membrane, or, through the membrane, on the internal wall of the cavum tympani; and in such cases the diagnosis should be readily made.

The absence of pain is important, for no other middle ear condition is associated with such extensive destructive changes unaccompanied by pain. Pain is also absent in sarcomatous conditions, and this possibility must be borne in mind, though other factors should suffice to distinguish the two conditions.

In no other condition does facial paralysis occur so early or with such frequency. It occurred in 45 per cent. of Milligan's (58) cases, while in his non-tuberculous cases he only observed it in 2 per cent. In the present series it was present in 33 per cent. We may contrast this high percentage with the figures given by Lake (47), who in 658 consecutive cases of suppurative otitis media only encountered facial paralysis in four. The presence of this sign is regarded by Grunert (59) as almost pathognomonic of tuberculosis in cases of chronic otorrhea.

The character of the discharge, foul and sanious, the early enlargement of the neighboring glands (in primary cases), and the occurrence of an indolent fistula over the mastoid, are all points which have special significance. In such cases as it can be detected the presence of stapedial mischief has been pointed out by Haike (40) as indicative of a tuberculous condition. The presence of profuse granulations is regarded by Gaudier (60) as a suspicious sign.

Jobson Horne (42) emphasizes the diagnostic importance of marked loss of hearing-power, and insists on the usual absence of headache, and on the occurrence of hemorrhages; while Politzer (23) lays stress on the rapidity with which the membrana is destroyed, and on the importance of the detection of carious bone on the inner wall of the cavum. When upon examination we find the membrana almost completely destroyed, the cavum filled with unhealthy granulations beneath which gritty bone can be felt, or when carious bone is visible, we cannot but strongly suspect the condition to be of a tuberculous nature, especially if the patient be an infant.

The discovery of the bacillus of tuberculosis by Koch placed in our hands a method of diagnosis of greater, and even of absolute, certainty. If the condition be one of tuberculosis we should expect to find the specific bacillus in the discharge. This was first done by Eschle (4) in 1883, and has since been done by numerous observers. Nathan affirmed that he was able to detect it in every case, but certainly most observers have been less fortunate, and there are undoubtedly cases in which the bacillus is not present in the discharge.

Since the discovery of the bacillus in the discharge by ordinary microscopic examination depends on its acid-fast staining reactions, it is important that we should realize that numerous other bacilli possess this reaction, which has been shown to be due to the presence of an envelope of a waxy nature surrounding the bacillus.

Of these the best known are *B. leprae, B. smegmae,* bacillus of timothy grass, and the butter bacillus. To these must be added others. Wingrave (49) in discussing the question relative to the occurrence of tubercle bacillus in the aural discharge draws up a list of eight bacilli known to have acid-fast properties. This list includes those already mentioned, and also the bacillus of syphilis (Lustgarten), and some bacilli associated with pulmonary gangrene, fetid bronchitis, and bronchiectasis. It is important to remember that many of these possess characters in which they differ from tubercle bacillus. Thus the *B. smegmae* is only found in the secretions of the external genitals, and it is easily bleached with alcohol; *B. leprae* practically never occurs in this country; Lustgarten's bacillus of syphilis is doubtful. The butter bacillus is probably a "grass bacillus" allied to that of timothy grass.

The acid-fast properties of the bacilli associated with pulmonary gangrene and bronchiectasis have been attributed by Fraenkel (50) to their occurrence in a medium rich in fatty acids and fats produced by putrefactive changes. It will thus be seen that the probability of acid-fast bacilli found in the aural discharge being identical with tubercle bacillus is great. In a series of 100 cases examined by Wingrave (49), twenty-four showed the presence of acid-fast bacilli in the discharge and the inoculation test showed that these were tubercle bacilli in seventeen cases. It is interesting to note that of the remaining seven cases, five were patients suffering from tuberculosis elsewhere.

It has been shown that the acid-fast reaction is due to the presence of a waxy envelope surrounding the bacilli (51). When we recollect that the same reaction is possessed to a high degree by the squames found in some cases in the middle-ear secretion, and that the secretion of the external ear consists largely of a waxy material, we at once see a possible source of error in relying on the detection of tubercle bacilli by its staining reactions only. It is possible that bacilli which are not normally acid-fast may acquire this property adventi-

tiously as a result of their growth and existence in a medium rich in fatty or waxy bodies. Thus Fraenkel (50) has shown that the bacillus which shows acid-fast properties in the secretions of pulmonary gangrene loses this property when cultivated on media in which fatty bodies do not exist. It is notable, however, that we have never met with acid-fast cocci in the discharge, though any cocci that may be present must be subject to the same conditions, and grow in the same waxy medium, and therefore might be expected to acquire this reaction whenever we find that the bacilli have acquired it adventitiously.

In order to obviate, so far as possible, these sources of error, it is advisable that the discharge to be examined be taken from the deepest accessible source, and then only after the cavity has been repeatedly flushed out. Films showing the presence of acid-fast squames should be discarded, for it has been pointed out by Wingrave that particles of these squames when broken up may be mistaken for tubercle bacilli.

In many cases it is possible to obtain scrapings from the granulations, and in them the tubercle bacillus may be found in large numbers. Histologic examination of the granulations may show the presence of caseation or giant-cell formation.

While it has been shown that some cases are not tuberculous yet show acid-fast bacilli in the discharge, the method fails in a far larger number of cases through inability to detect tubercle bacilli in cases which are tuberculous. The discovery of the bacilli is nearly always attended with considerable difficulty, and in the majority of cases it is only after prolonged search through many films that they are detected. It is stated by Brieger that the bacilli are not infrequently absent from the discharge. In some cases, however, this difficulty disappears, and they are met with in considerable quantities. This usually occurs in acute cases and early in the condition, for, as has been pointed out, the bacilli are frequently destroyed in the putrefactive changes initiated by other organisms.

Examination of the neighboring lymph-glands may show the presence of typical tuberculous changes and thus clear the diagnosis. If doubt still exists our final court of appeal lies in experimental inoculation of animals, as has been done by Milligan (7), who thus obtained positive proof in eight out of ten cases submitted to this method. (It is of interest to note that the two negative cases were patients aged nineteen and

eleven years respectively, while the eight positive were all patients under three years.)

This method involves time and is frequently impracticable except in hospitals associated with pathologic laboratories. For practical purposes, then, we must rely on the clinical appearances and history, and the microscopical examination of the discharge as the joint foundations of our diagnosis, and in most cases these give sufficient data. In cases of chronic otorrhea, without pain, and associated with multiple perforations or destruction of the membrana, temporal caries, facial paralysis, or enlargement of the lymph-glands, we may accept the presence of acid and alcohol-fast bacilli in the discharge as proof of the tuberculous nature of the disease with confidence.

CASE 1.—M. H—, aged 9 months. When patient was seven months old a swelling was noticed behind and below the right ear, from which a discharge was observed three weeks later. Patient was the youngest of three; the other two had never shown any signs of tuberculosis. Parents healthy. The mother's brother died of phthisis. Patient was breast-fed entirely until admission. No history of previous illness except chicken-pox some months ago and diarrhea and cough just prior to present condition.

On admission—General condition poor. Marked swelling over and below mastoid on right side; discharge from right ear. Glands below right ear enlarged.

The mastoid abscess was opened and the underlying bone found to be carious, a perforation into the antrum being found. This was opened up and antrum and cavum found to be filled with debris. The ossicles were detached and carious and the membrana was found to be almost entirely destroyed. There was extensive caries of the temporal bone. The carious bone was thoroughly scraped away and the antrum and cavum were laid freely open. The posterior wound was closed and the cavity packed through the external meatus. Examination of *debris* from the antrum and cavum showed presence of tubercle bacilli in large numbers. Subsequently the local condition remained satisfactory but patient's general condition did not improve. Six days after operation temperature rose to 102.4° F. Suddenly an erythematous rash developed, diarrhea and later a cough set in, and patient died three days later.

Post-mortem.—The local wound was quite clean. The apex of the right petrous temporal bone was carious, a small collection of caseous debris in this position being separated from the middle ear by a layer of apparently healthy bone. The left petrous temporal also showed some caries. There was no meningitis and no thickening of the dura covering the temporal bones. The left lung showed a patch of tuberculous bronchopneumonia in the basal lobe. Miliary tubercles were present in both lungs and in the spleen. Examination of the other organs showed no sign of tubercle elsewhere.

CASE 2.—M. G—, aged 3 months. Patient was healthy until three weeks before admission, when he began to "go back" and a lump was noticed below the left ear. This increased in size and a week later complete facial paralysis set in suddenly on the left side. Three or four days later discharge from the left ear was observed. Patient was breast-fed until admission to hospital. No history of tuberculosis in the family.

On admission—Nutrition fair. Complete facial paralysis on the left side. Below the left ear were large masses of glands; behind the ear was a fluctuating swelling. From the ear thick fetid discharge issued, examination of which revealed the presence of tubercle bacilli. Examination of other systems revealed nothing abnormal. As the membrana was completely destroyed an attempt was made to improve the local condition by antiseptic flushing, etc. There being no resulting improvement locally, the enlarged glands—which were mostly caseous—were removed, the mastoid was exposed and found to be perforated On opening up the antrum it was found to be filled with caseous debris. The cavum contained similar material and the adjacent bone was carious. In the tegmen tympani was an irregular shaped opening covered by thickened dura mater. The ossicles were lying loose and were carious. All the carious material was freely scraped away and the cavity was packed with iodoform gauze through the external meatus. Subsequently the cavity was syringed with peroxide of hydrogen until discharge ceased, after which it was kept dry. Seven days after operation temperature rose and cough developed and became incessant, diarrhea set in and purpuric spots appeared on the skin of the trunk. Patient sank rapidly and died twenty-three days after operation.

Post-mortem.— The local conditions appeared quite satisfactory. There was no meningitis, though the dura was thick-

ened over the aperture in the middle cranial fossa. Miliary tubercles were found scattered through the spleen and both lungs. There was no sign of tuberculosis of the bronchial or mesenteric glands or elsewhere.

CASE 3.—J. D—, aged 2 years. Patient was under treatment for tuberculosis of the retropharyngeal and deep cervical glands. There was nothing suggestive of middle-ear mischief —no otorrhea, no facial paralysis, no enlargement of mastoid glands. Subsequently signs of tuberculosis of the right apex developed, together with signs of enlargement of the bronchial glands and later of laryngeal tuberculosis, and a fatal termination ensued. Patient had been breast-fed nine months, and there was no family history of tuberculosis.

Post-mortem showed extensive consolidation of upper lobe of right lung, with a small cavity—the size of a pea—in front. The pleura over the apex was thick and laminated. Bronchial glands were caseous. The larynx showed ulceration of the aryteno-epiglottidean folds. Cervical glands were caseous in the right carotid and supraclavicular triangles. The pericaridium showed a small patch of inflammation near its reflection from the great vessels. Miliary tubercles were scattered throughout both lungs; mesenteric glands were caseous. The right temporal bone was carious between the apex of the pars petrosa and the cavum tympani, which contained caseous debris. This was examined, and turbercle bacilli were found in it. The membrana was intact.

CASE 4.—E. F—, aged 1 year and 1 month. Patient was admitted suffering from otorrhea on the right side, of one month's duration. A week after commencement of the discharge swelling over the mastoid was seen. Patient was breast-fed until admission, and there was no family history of tuberculosis.

On admission—General condition fair. Slight swelling over the right mastoid; no facial paralysis; foul-smelling discharge from ear. The discharge was examined for tubercle bacilli, but the result was negative. Examination of other organs revealed nothing of note. Patient was operated upon, the antrum being found to be perforated high up and far back. Antrum was filled with caseous debris and granulation tissue, beneath which was carious bone. The membrana had a single perforation of very large size. Operation was completed as in Cases 1 and 2. Scrapings from the granulation tissue were examined, and tubercle bacilli found in them.

Subsequently the local condition did satisfactorily, and the wound remained dry. Patient's general condition, however, was not very satisfactory, and he was taken home by his parents. Six months later he was reported to be in fair general health.

CASE 5.—P. S—, aged 6 years. Eighteen months prior to admission facial paralysis suddenly occurred on the right side. This was followed soon after by discharge from the right ear. Gradually the glands in the neck became enlarged. The aural discharge has continued ever since. Previous illnesses include tabes mesenterica when two years old.

On admission—There was absolute paralysis of right side of face; the cervical glands formed bulky masses below the right ear and over the mastoid. Glands were also felt in the anterior triangle on the left side. From the right ear issued abundant fetid discharge, examination of which showed tubercle bacilli only after several films were examined. Four days after admission meningeal symptoms set in, and death supervened fourteen days later. Prior to death lumbar puncture revealed presence of lymphocytosis and turbidity of the cerebro-spinal fluid, and tubercle bacillus was found after centrifuging. Permission for post-mortem could not be obtained.

CASE 6.—E. B—, aged 1 year and 9 months. Patient was admitted with history of diarrhea and vomiting for a fortnight. A week later cough set in and became urgent. Coma supervened gradually, and was nearly complete when patient was admitted. No history of facial paralysis or otorrhea. Patient had been breast-fed until sixteen months, and there was no family history of tuberculosis. Patient died twelve hours after admission, never having regained consciousness.

Post-mortem showed acute pneumonic phthisis of both bases, with early excavation of right base. Bronchial glands enlarged. On opening the skull the meningeal veins were found to be extensively thrombosed on both sides, and there was hemorrhage over the left Rolandic area. On opening the temporal bones caries was found on both sides, the middle ears containing thick pus, which, on examination, was found to contain tubercle bacilli and streptococci.

CASE 7.—J. J—, aged 2 years and 6 months. Patient had been gradually wasting for a year. She had had otorrhea for four months and enlargement of the cervical glands for near-

ly a year. Facial paralysis had not been observed by her guardian. Patient was youngest of six, of whom three died—cause unknown. Patient was breast-fed for seven months, and weaned on account of the mother's health. Her mother died a year ago of phthisis.

On admission.—General nutrition very poor. There was almost complete paralysis of left side of face. From the left ear was offensive discharge. The cervical glands formed large masses on both sides of the neck. Some of the glands appeared to be softening, but there were no actual abscesses. There was percussion dullness behind the manubrium sterni. Masses of glands were palpable in the abdomen, and the liver was enlarged. The lungs appeared healthy. Examination of the aural discharge showed tubercle bacilli in every film. Patient was removed from hospital, and died at home six months later.

CASE 8.—G. H—, aged 1 year and 6 months. Patient was admitted for tuberculosis of lungs and peritoneum of two months' duration. He had otorrhea from left ear for three months. He had been breast-fed for eleven months.

On admission.—In addition to signs of peritonitis and pulmonary tuberculosis patient had slight discharge from both ears. Both membranæ were perforated. Tubercle bacillus was found in discharge from left side. There was no facial paralysis, and no glands were palpable. Patient died a week after admission.

Post-mortem.—Patch of tuberculous broncho-pneumonia in right apex; bronchial glands caseous; general tuberculous peritonitis of the adhesive type; mesenteric glands caseous; liver showed a caseous area, to which the bowel was adherent. No signs of tuberculosis elsewhere except caries of left temporal bone in region of inner ear and mastoid, the tympanic cavity being filled with debris.

CASE 9.—G. F—, aged 1 year. Patient had history of otorrhea on right side for three months, with enlargement of mastoid glands, which had been lanced two months ago. Patient had been wasting for some months, and had had a purpuric rash for six weeks. Patient had been bottle-fed on patent foods entirely. No family history of tuberculosis.

On admission.—Patient was wasted, and had a peculiar waxy-yellowish color. Over the right mastoid was a discharging sinus. There was no aural discharge, but the glands

below the right ear were enlarged. The membrane was intact. Large masses of glands were palpable in the abdomen and the spleen was palpable. The sinus over the mastoid was opened up, and the carious bone scraped. The antrum was found to be filled with debris, in which, on examination tubercle bacillus was found. Subsequently, pulmonary symptoms set in, Eustace Smith's murmur became audible, and increased. Death occured five weeks after operation.

Post-mortem.—Extensive pneumonic phthisis of right upper lobe, patches of broncho-pneumonic tubercle in both lower lobes. Bronchial glands enlarged and firm. Mesenteric glands caseous. Spleen enlarged, and containing caseous nodules as large as a marble. Permission to open the skull was not obtained.

CASE 10.—W. E—, aged 4 months. Patient had been breast-fed one month. The mother has phthisis. Otorrhea appeared on the right side when patient was two months old. This was speedily followed by swelling of the glands behind and below the ears, and later of those in the parotid region. Facial paralysis set in five weeks before admission.

On admission.—There was complete paralysis of right side of face. There was copious fetid discharge, containing tubercle bacilli in very large numbers (ten to fifteen in almost every field), from the right ear. The membrane was completely destroyed, the meatus opening into a large cavity. A probe passed in horizontally encountered carious bone at a depth of two inches. The glands were much enlarged below, behind, and in front of the ear. The general condition was considered to be too enfeebled to admit of radical operation. Patient died a month later.

Post-mortem.— Mesenteric glands caseous. Miliary tubercles in both lungs. There were two collections of greenish pus in front of the sterno-mastoid muscle on the right side. The neighboring glands were enlarged and caseous. In dissecting them up one opened into a large cavity with irregular sloughing walls. The inner wall was composed of the carious remains of the temporal bone. The external meatus opened directly into the cavity. The mastoid antrum and cavum were completely destroyed. On opening the skull thickening of the dura covering the tegmen tympani was seen. The tegmen itself was carious. The bone forming the outer wall of the antrum and that forming the posterior wall of the external meatus were completely destroyed.

CASE 11.—V. D—, aged 5½ years. Patient has had enlarged glands on both sides and double otorrhea (intermittent) since he was ten months old. There is a family history of tuberculosis. Patient had been breast-fed.

On admission patient had discharge from right ear (none from left ear). The right membrane was completely destroyed and carious bone was palpable. Tubercle bacillus was found in the discharge in small numbers. There was complete nerve deafness on right side, and hearing on left side was markedly impaired. Patient had adenoids, which were subsequently removed. Enlarged glands were present in the parotid region—where there was a discharging sinus—and below the ear in front of and behind the right sterno-mastoid muscle. These glands were excised or scraped, and found to be typical caseating glands. The antrum was opened up, and found to be filled with caseous debris. The walls of the cavum were carious. The carious bone was removed, and the middle ear packed through the meatus. Patient's subsequent progress was satisfactory.

CASE 12.—A. H—, aged 2 years and 9 months. Swelling over the left mastoid came on when patient was two years and seven months. This was soon followed by otorrhea. There was the history of night-sweats for three months. Patient had been breast-fed for thirteen months. The mother is stated to be phthisical.

On admission.—There was otorrhea on left side, a fluctuating swelling was present behind the ear. Enlarged glands were present in the posterior triangle. There was no facial paralysis. The aural discharge contained tubercle bacilli in very large quantities. There was impaired percussion-resonance over the manubrium sterni, Eustace Smith's murmur was present. No palpable glands in the abdomen.

The antrum was opened up and found to be filled with caseous debris. It was cleared out, and the complete operation was performed. A caseating gland below the ear was scraped out. Patient made a good recovery, and after-progress was quite satisfactory.

PROGNOSIS.

Of the above twelve cases it will be seen that no fewer than nine terminated fatally. In two cases the aural condition was not suspected until it was revealed on the post-mortem table.

It will also be seen that of the nine fatal cases no less than eight had tuberculous lesions elsewhere at death, thus substantiating that the condition does not usually reveal itself prior to the commencement of dissemination. It is largely on this account that the prognosis is so gloomy. Miliary tuberculosis might be expected to be of frequent occurrence when we recollect the age-incidence of the condition and the frequent association of miliary and of bone tuberculosis be considered. In the present series it was seen on four occasions, and the presence of menigitis in another case (No. 5), not subjected to post-mortem examination, points to its occurrence in a fifth.

Politzer, as has already been mentioned, is of opinion that the conditon never undergoes spontaneous cure, and even casts doubt on the authenticity of such cases as have been reported cured.

The prognosis of the condition when it arises as a complication of phthisis no doubt largely depends on the course taken by the pulmonary condition; and since this complication most frequently arises late in the course of phthisis—especially where there is cavitation—we can rarely expect to see recovery in such cases, though it has been reported by Milligan and others.

Of the general considerations which might be held to account for the bad prognosis of such cases as are to be considered as primary, the most important are the age-incidence, the affection of bone, and the unsatisfactory results of treatment.

It has been shown that the condition when primary is more frequent in infants under two or three years of age than at any other age, and the feeble resistance to tuberculosis shown by patients at this age and the frequency of miliary dissemination largely account for the frequency of a fatal issue. The affection of the bone is also of significance in view of the frequency with which miliary tuberculosis arises from a focus in bone.

The unsatisfactory results of treatment are, unfortunately, only too patent. Milligan states that "at least 40 per cent. of my cases of proved tuberculous infection have succumbed to the disease." In the present series the case mortality was 75 per cent., though it is only fair to state that in 16 per cent. the condition was unsuspected during life and no local treatment had been employed. It does not come within the scope of the present paper to discuss treatment except in so far as it affects the prognosis. There are numerous reasons why operative

interference has done so little to reduce the case mortality. It must be remembered—and this cannot be too freely insisted upon—that treatment is usually commenced too late, the condition is usually too far advanced for half-measures, and the patients are too young, and usually too much reduced in strength, to stand extensive radical operative interference.

Amongst the factors regarded as of most evil omen by Milligan are the presence of extensive caries, facial paralysis, copious blood-stained discharge, of massive enlargement of the lymph glands, and the presence of tuberculous lesions elsewhere; and it will be seen that these are the very symptoms for the relief of which the patient first comes under the notice of the surgeon. Briefly, we may say that the insidious onset and the absence of pain are the causes of the high death rate, for the patient is rarely subject to treatment until the condition locally has become too advanced for cure or until the dissemination has become already established.

The presence of extensive disease in an infant at an age when radical operative proceedings are not well borne, and at which widespread dissemination through the blood-stream is prone to occur, affords little prospect of successful treatment. It must not, however, be forgotten that some primary cases even at this early age if promptly treated may improve or recover. Successful cases, in which cure has resulted, have been reported by Milligan and others even in patients in the first year of life. Of few other chronic conditions can it with equal justice be said that the condition most favorable to prognosis is the early diagnosis of the disease.

REFERENCES.

1. Young and Milligan.—Journ. of Laryngol., September, 1905.
2. Wilde.—Aural Surgery, 1853.
3. Toynbee.—Diseases of the Ear, 1860.
4. Eschle.—Deutsch. med. Woch., 1883.
5. Nathan.—Deutsch.. Archiv f. klin. Med. vol. xxxv.
6. Grimmer.—Arch. of Otol., vol. xxxi.
7. Milligan.—Brit. Med. Journ., vol. ii, 1895.
8. Wingrave.—Journ. of Laryngol., March, 1903.
9. Knapp.—Arch. of Otol., 1894.
10. Goldstein.—Journ. of Laryngol., March, 1903.
11. Williams.—Trans. Minn. Med. Soc., 1895.
12. McCaw.—Medical News, October, 1901.
13. Oppikofer.—Arch. of Otol., August, 1905.
14. Jobson Horne.—Journ. of Laryngol., April, 1903.
15. Hurd.—Arch. of Otol., August, 1905.
16. Schwabach.—Quoted by Goldstein (10).
17. Moldenhauer.—Monatschr. f. Ohrenheilk., 1885.

18. Carr.—Trans. Med. Soc., vol. xvii.
19. Still.—Brit. Med. Journ., vol. ii, 1899.
20. Schwabach.—Loc. cit.
21. Milligan.—Journ. of Laryngol. March, 1903.
22. Whitehead.—Ibid., March, 1903..
23. Politzer.—Diseases of the Ear, 4th ed., 1902..
24. Breiger.—Sixth International Congress Otol., 1899.
25. Haug.—Arch. f. Ohrenheilk., 1891.
26. Milligan.—Med. Chronicle, January, 1896.
27. Habermann.—Arch. f. Ohrenheilk., 1886.
28. Jobson Horne.—Brit. Med. Journ., September 31st, 1903.
29. McBride and Turner.—Edin. Med. Journ., May, 1897.
30. Pilliet.—Quoted by McBride and Turner.
31. Dieulafoy.—Bull. Acad. de Med., Paris, 1905.
32. Brindel.—Quoted by McBride and Turner.
33. Gottstein.—Berlin. klin. Woch., August, 1896.
34. Pfluder and Fischer.—Arch. f. Laryngol. u. Rhinol., 1896.
35. Milligan.—Jour. of Laryngol, March, 1903.
36. Poirier and Cuneo.—The Lymphatics. Trans. by Cecil Leaf.
37. Barnich.—Arch. f. Ohrenheilk., 1889.
38. Cornet.—Tuberculosis (Nothnagel's Practice).
39. Haberman.—Arch. f. Ohrenheilk., 1889.
40. Haike.—Ibid., vol. xlviii.
41. Kössel.—Ibid., 1894.
42. Jobson Horne.—Journ. of Laryngol., March, 1903.
43. Macewen.—Brit. Med. Journ., July 30th, 1904.
44. Mathews.—Brit. Journ. Child. Dis., March, 1906.
45. Urban Pritchard.—Journ. of Laryngol., April, 1903.
46. Blake and Buck.—New York Med. Journ., 1886.
47. Lake.—Journ. of Laryngol., May, 1895.
48. Oppikofer.—Arch. of Otol., August, 1905.
49. Wingrave.—Journ. of Laryngol., March, 1903.
50. Fraenkel.—Brit. Med. Journ. (Epitome), June 14th, 1902.
51. Bulloch.—Trans. Brit. Congress Tubercle.
52. Freysing.—Arch. of Otol., 1899.
53. Price-Jones.—Practitioner, vol. lxxi.
54. Nathan Raw.—Lancet, August 5th, 1905.
55. Cheatle.—Arch. of Otol., 1899.
56. Wingrave.—Journ. of Laryngol., vol. xii.
57. Milligan.—Sixth Internat. Otol. Congress, 1899.
58. Milligan.—Medical Press, March 4th, 1903.
59. Grunert.—Münch. med. Woch., 1899.
60. Gaudier.—Annalss de Mal. de l'Oreille, June, 1899.
61. Lartigan and Nicol.—Amer. Journ. Med. Sci., June, 1902.
62. Holt.—Diseases of Infancy and Childhood.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I.—EAR.

Symptomless Mastoiditis, Followed by Meningitis and Death.

A. B. BENNETT, Washington (*Medical Record*, April 13, 1907,) This case is unique in that the patient was under observation for some two months before his death, and at no time showed any mastoid symptoms whatever, and no symptoms suggestive of any serious ear trouble until four days before death, when he became ill with headache, vertigo, nausea and vomiting. On admittance to hospital the temperature ranged between 97.4 and 98, and he seemed better. The tympanic membrane showed nothing. There was no mastoid tenderness on either side. The nausea, explosive vomiting and vertigo occurred two days after admission.

Both mastoids were operated on, one side having a tremendous amount of carious bone, the other side much less. The patient never recovered consciousness after the operation, but died in twelve hours. At the autopsy there was a markedly congested pia mater covered with purulent lymph, and on removing the brain and cutting the spinal cord, there was an outflow of blood and pus in large quantities, the brain being literally bathed in pus. There was a diffuse leptomeningitis over the entire cerebrum and cerebellum, with pus in the lateral ventricles. The right lateral sinus was thrombosed, and it appears that the leptomeningitis was probably of otic origin. There was no fever until four hours before the operation, and at no time was there any mastoid tenderness. The membrana tympani never perforated or discharged, but the conditions steadily improved, as did also the hearing, and the symptoms of meningitis were the first symptoms that pointed toward operative interference. *Richards.*

Aspiration in Otitis Media Acuta.

PERCY R. WOOD, Marshalltown, Iowa (*Medical Record*, April 13, 1907), has devised an aspiration apparatus for use in acute otitis media, consisting of a glass tube three inches long with a reservoir for exudates. The aural extremity tapers and

is tipped with rubber, and to the other is attached a syringe with a good sized air chamber. When in place, the rubber tipped end seals the opening, the piston is drawn out gently and retained until the reservoir fills, or until no further exudates, blood, or serum escape. By this means these cavities are relieved of vast quantities of pathological secretions which would never entirely drain away or be absorbed, but remain throughout life to threaten the integrity of the parts.

Richards.

The Eustachian Tube, Its Anatomy and Its Movements: With a Description of the Cartilages, Muscles, Fasciae and the Fossa of Rosenmüller.

W. SOHIER BRYANT, New York City (*Medical Record,* June 8, 1907). An anatomic study, the conclusion of which is "The physiological function of ventilating the tympanic cavity is accomplished mainly by the dilator tubae or levator palati. The mechanism which allows the opening of the tuba auditiva is the backward pressure of this muscle on the angular process of the alar cartilage, which swings backward, upward, and inward on its superior attachment, dragging with it the floor of the tube and forming a triangular ostium." *Richards.*

The Value of the Blood Clot as a Primary Dressing in Mastoid Operations.

CLARENCE J. BLAKE, Boston, Mass. (Read at Toronto, British Medical Association, 1906). The method consists in making the primary incision as clean-cut as possible, the retraction of the periosteum without injury, the controlling of the bleeding by hemostats or broad-bladed retractors, the making of the opening in the outer mastoid cortex so large as to include all areas of defective bone, and then the careful removal of all diseased bone by means of chisels and sharp, long tipped, unfenestrated spoons, down to the inner cortical walls, taking especial care to remove the bases of the trabeculous projections with their interlamellar diploe and to search out adventitious cortical cells and, by curetting, make them a a part of the general cavity, which is then packed firmly with small, dry involuted gauze sponges. These sponges are allowed to remain for a minute or more, then the area is carefully examined and all necrotic or suspicious areas excised or curetted. This is continued until the operator is satisfied

that the mastoid cavity is absolutely free from diseased bone. The sponges are then removed, the cavity in the mastoid allowed to fill with blood from the cut surfaces of the soft tissues, and as soon as clotting is evidenced, the wound edges are brought into position and retained by gut sutures or pressure pads, the lower portion of the incision being left free for seepage of serum from the blood clot.

The drum head is incised by a crescentic cut following the posterior superior periphery, and the horizontal mucous folds, if present in the antrum locality, are also cut, since these sometimes present an obstruction, by their engorgement and swelling, to effective drainage. The canal and middle ear are carefully cleansed and stopped with a gauze wick.

The percentage of primary healing, that is to say, cessation of serous seepage in the lower portion of the mastoid wound, absence of granulomata, and healing within eight to ten days after operation, varied from 12 to 50 per cent, the latter being selected cases. The total number of cases operated on by this method was less than 250.

Inasmuch as this method, when it is successful, results in mitigation of pain and discomfort and shortening the duration of after-treatment, the author thinks it is worth striving for, since success presupposes an advance in the surgical thoroughness of the operation itself and the application of a judicious consideration of conditions, which is as much a part of the real domain of surgery as is the application of structural knowledge or of manipulative skill.

If the mastoid cavity is thoroughly cleansed and safeguarded from without, it is subjected to reinfection through one channel, namely: that leading from the middle ear, and this cavity should of itself be thoroughly cleansed and independently drained through the external auditory canal.

In case the blood clot does break down and comes away entirely, it results in the formation of foundation granulomata, which are a basis for subsequent repair, with speedier and more satisfactory results in healing than are obtainable when the wound is dry-packed from the beginning. The only cases in which the blood clot dressing is inapplicable are those in which, on account of pyogenic invasion of surrounding structures, it is desirable to keep the mastoid cavity open as a path of access, and those in which the systemic condition of the patient, or the extent of the local infection, do not warrant the expectation of speedy repair. *Richards.*

Chronic Middle Ear Suppuration and Surgical Interference.

EMIL AMBERG, Detroit (*Journal of the Michigan State Medical Society*, March, 1907), has collated the reports as regards the time of healing after the radical mastoid operation from some thirty different operators, the average time being two months and twenty-six days. His conclusion is that only exceptionally a chronic middle ear suppuration which does not respond to mild treatment without more thorough surgical interference, should be allowed to continue. The less radical procedure should first be considered, and the more radical measures not delayed too long. *Richards.*

Ototympanitis Suppurativa Acuta and Tympano-Mastoiditis Suppurativa Acuta.

EMIL AMBERG, Detroit (*Leucocyte*, February, 1907). On account of the fact that the mastoid cells are part of the middle ear, the author regards the term "otitis media" as incorrect, and suggests the term "ototympanum" and "ototympanitis" for the commonly accepted otitis media acuta, and "tympano-mastoiditis acuta suppurativa" for acute inflammation of the mastoid. *Richards.*

Headaches Due to Aural Disease.

PHILIP HAMMOND, Boston (*Journal A. M. A.*, November 1, 1906). There is an intimate connection between the innervation of the ear and the central nervous system. Headache may be due to various aural causes, among them cerumen in the canal, obstruction of the Eustachian tubes, inflammation of the middle ear, chronic suppuration, pressure from exfoliated epithelium, and cholesteatoma. The treatment should be that for the aural condition which is present.

Richards.

The Tumors of the External Auditory Canal (Melanoma).

ERICH DALLMANN (*Archiv für Ohrenheilkunde*, Bd. 10, Heft 1 and 2, 1906) reports the case of a tumor of the external auditory canal. The patient was a woman, aged 44 years, who had been treated in the Surgical Clinic in Halle, for a fibroma molluscum of the left femur, over fifty pounds of which had been removed at different times. Distributed over the entire surface of the body are small pigmented warts

from the size of a seed to a hazelnut. A week before the patient presented herself to the ear clinic in Halle for treatment, she noticed that she could not hear well with the left ear. She had never had trouble with her ears before. For three days she had also suffered from severe pain in the left side of the head. On examining the ear it was found that the region of the tragus and mastoid were sensitive to pressure. A tumor was present in the external canal, situated about at the junction of its cartilaginous and bony portion and entirely occluding its lumen.

The tumor had a bluish-brown color and was of rather dense consistency. The right m. t. was normal. Hearing test showed that the difficulty was purely in the sound-conducting apparatus. The tumor was removed with the hot loop. There was a slight injection of the m. t. around the handle of the malleus, the drum membrane otherwise being practically normal. The pain in the left side of the head was considered to have been caused by the pressure of the tumor.

On miscroscopic examination the growth was found to be a papillary one, a melanotic skin nevus.

The author believes that the growth, because of its remarkable richness in cells and the presence of pigment in the cells, may be a melanosarcoma, that is, it may represent the change of a benign growth (papilloma) into a malignant growth.

There had been no recurrence three months after the operation. *Theisen.*

Clinical Experiences with Artificially Induced Hyperemia According to Bier's Method in the Treatment of Otitis Media.

F. ISEMER (*Archiv für Ohrenheilkunde*, Band 69, Heft 1 and 2, p. 131). Under the direction of Prof. Schwartze, the author has tried Bier's hyperemia upon 12 cases of suppuration of the ear. In 9 of the cases the mastoid was more or less involved. Eleven of these were acute and one chronic. The technic used in producing hyperemia was the same as advocated in the clinic at Bonn; the usual elastic bandage tightened by means of hooks or some other simple device was used.

The length of application varied between 20 and 22 hours during the first day, being diminished as the case improved.

The hyperemia was well supported in each instance. As already noted by Keppler, the pain diminished upon application

of the bandage. The surgical interference may have been largely responsible for this, as in each case paracentesis was performed when indicated. Of the 12 cases treated, in spite of long hyperemia, 5 of them came to the operating table. Four of these five cases were infections due to diplococcus. In each case the author noted apparent benefit as regards the general condition of the patient. The author cites one case in which a marked improvement in the general condition of the patient was by observation, although it came under treatment with most critical symptoms. So improved was he after one or two days, that he was able to play with his fellow patients as though completely well. This improvement was not permanent. Without any external cause, violent symptoms developed as marked by high fever, swelling behind the ear, extreme pain and increasing tenderness on pressure. The operation was performed at once, and showed the most extensive destruction of tissue, reaching as far as the dura and the sinus, causing extradural and perisinual abscesses. . . . . These severe disturbances, which had developed during the treatment, were masked by apparent benefit, although a cure without operation was impossible.

Bier saw a case of abscess of the temporal lobe which, under the hyperemia treatment, improved so markedly that the patient felt entirely well, and could leave his bed. Suddenly the patient's condition was much worse. The operation was performed and a large abscess of the temporal lobe was exposed. Patient died in two days.

The remaining cases, 5 of which were complicated with mastoid disease, healed with two exceptions. The method of treatment seemed to have brought about a cure in less time than is ordinarily necessary. The author believes that one can be easily deceived in laying too much value upon a method which has been tried in so few cases. Two cases remained uncured. These were due to infections after scarletina.

Bier considers the excellent functional results which he attained as one of the greatest advantages of this method. The author, however, does not find that there is any improvement over previous methods. In this respect he also considers the method as one extremely dangerous in the hands of the general practitioner, as the symptoms suddenly become threatening, and the proper time for the operation may pass unknown.

Resumé:

1. The treatment of hyperemia is dangerous, as the apparent benefit will conceal the proper moment for surgical interference.

2. It remains for further statistics to decide for which forms of information, under what stage the treatment is indicated, and how long it should be continued before operative interference.

3. Specially dangerous is the protracted treatment with hyperemia when the infection is due to the diplococcus.

4. In case of intracranial complications, sinus thrombosus, extradural abscess, and brain abscess, the method is positively useless. *Harris (Gignoux.)*

Cholesteatoma of the Ear.

De Stella (*Revue Hebdomadaire,* January 6th, 1906). Attention is called to the wide difference between the false and the true cholesteatoma. One is of comparative frequency and is usually free from serious consequences, the other, so rare in its occurrence that Politzer has never seen a case, is fraught with grave danger to life. The latter is really an endothelioma. The situation in the auditory canal, antrum and middle ear is overturned. The etiology appears not yet to be definitely understood. It is known that it can develop without any participation of the canal epithelium. The hyperplasia of the endothelium may occur independently of any inflammatory process. It is especially the complications that make the true or endothelioma so dangerous; many cases develop meningitis. As is known, the symptoms are often insidious and tumor is recognized only by chance.

The author regards the operative removal a simple one. He advises always closing the postoperative wound. De Stella had recently seen a case of true cholesteatoma in a man of fifty, who had suffered from several attacks of acute otitis media suppurativa—the last, ten years before. Six weeks before consulting de Stella, he was seized with pains in the ear, followed in three weeks by a facial paralysis upon the affected side. The canal was found filled by cholesteatomatous lamellae extending into the attic and presumedly the antrum. A probe could be introduced through the posterior wall into a very large cavity in the mastoid behind. The operation revealed the characteristic excavation involving antrum, attic and mastoid cells. The case made a successful recovery.

The Treatment of Acute Otitis Media Purulenta and Mastoiditis by Means of Artificially Induced Hyperemia (Bier's Method).

DR. KOPETSKY (*New York Med. Journal,* July 14, 1906). An excellent statement of this most promising method of treatment, which Bier first brought forward in 1903. Keppler and Heine were the first to apply it to the ear. Keppler reported 21 cases. Of these, 11 were cases of acute otitis with a mastoid involvement. These all recovered without operation. Heine employed the method in 19 cases. Of these, there were 15 acute with and without mastoiditis; of which seven recovered in from six to ten days without operation. One of these relapsed and required an operation later. Kopetsky tried the method in six cases of acute otitis with mastoiditis. In five of these there was a recovery without operation in from two to thirteen days. The technic as advised by Bier was the one employed. The patient is put to bed. A slightly elastic bandage one to one and one-half inches wide and provided with hook and eyes is applied to the neck with pressure to produce slight congestion but no pain. This is allowed to remain 24 hours. During this time it may be necessary to tighten the bandage if it becomes loose. Raising the foot of the bed still further assists in securing the hyperemia.

Exostoses and Hyperostoses of the Ear Canal as a Cause for Severe Purulent Otitis.

HANOVER (*Archives of Otology,* Vol. XXXV, No. 6). Though the formerly accepted statement that hyperostoses of the canal occur after middle ear diseases is now discredited, the opposite condition, namely: that occluding exostosis can produce middle ear disease, is not mentioned in literature.

A patient, aged 19, has suffered for at least 11 years from an occluding exostosis in the right canal. Recently he complained of deafness and headache. There are no signs of inflammation. On detaching the auricle and removing the tumor, the M. T., ossicles and outer attic wall were found absent. The tympanum contains detritus and the antrum is small and filled with granulations. Three and one-half weeks later symptoms of pyemia developed, and further operation revealed a small fistula extending to the sinus.

A second case, that of a woman, aged 38, presented large exostoses in both auditory canals. A short time ago the patient noticed a diminution of hearing and a slight discharge from her

left ear. On irrigating the canal with a tympanic canula the fluid passed into the pharynx. Daily irrigation followed by the use of alcohol, improved the condition in the left ear, but the persistence of the mucus secretion and mastoid tenderness necessitated a mastoid operation one year later. The hyperostosis was not removed, but the ear canal is dry and free from detritus. *Campbell.*

Herpes of the Auricle with Neuritis of the Facial Nerve.

SARAI, Japan (*Archives of Otology* Vol. XXXV, No. 6). This association has not been frequently noted. The only textbooks which report observations of this occurence are those of Politzer and Gruber. In the two cases cited, whereas the herpetic condition disappeared in about two weeks, the facial paralysis persisted in the one case six weeks, and in the other four months. The vesicles were not situated in the area of distribution of the facial nerve, but in that of the auriculotemporal. *Campbell.*

A Case of Bilateral Cerebral Disturbance of Hearing with Aphasia.

BOENNINGHAUS, Breslau (*Archives of Otology,* Vol. XXXV, No. 6). A man, aged 45, in the enjoyment of perfect health, while taking a walk, suddenly became totally deaf and lost the power of speech. In the absence of other symptoms of paralysis, a diagnosis was made of apoplexy of the hearing and speech centres.

In the following weeks speech improved and he could be understood, though with difficulty.

Hearing began to improve after two months; conversational voice, the winding of a watch and the clapping of hands are heard. The upper tone series is heard clearly but the lower tone series, on the right side below H and the left side below A, are not heard. Bone-conduction is lost. Notwithstanding this relatively good hearing, the patient does not understand anything. All sounds produce the same unintelligible noise.

As regards the disturbance of speech, the patient evidently suffers from sensory aphasia—that is, psychic deafness associated with paraphasia.

The seat of this disease is situated in the area of the left first temporal convolution. In man this is the centre of sound memories and the impulse passes from this point to the motor speech centre of Broca, in the left third frontal con-

volution, which in turn causes the speaking muscles to receive the proper innervation in order to perform their complicated functions.

The disturbance of hearing is thus explained. Seven years ago the patient suffered from a stroke of apoplexy. The left half of the body was completely paralyzed for two hours. A remnant of this paralysis persists in a slight drooping of the left angle of the mouth, and the left side of the body is more or less anesthetic. The lesion must have been in the internal capsule. The right auditory tract must have been completely destroyed, because this explains why, after the second apoplexy, the patient was totally deaf for two months. The partial reappearance of hearing is explained by the left temporal lobe recovering on the establishment of the collateral circulation.

The apoplectic lesion must to-day be limited to a part of the sensory speech centre and to a part of the rest of the left temporal lobe, which, just as the right, simply serves for purely physical hearing. *Campbell.*

Report of a Case of Purulent Meningitis Following Radical Mastoid Operation—Recovery After Operative Interference.

HELD and KOPETZKY, New York (*Archives of Otology*, Vol. XXXV, No. 6). A little girl, aged 3, had a double chronic otitis media purulenta. A radical mastoid operation was performed on the right side, the tegmen antri was removed and an area of dura about one centimetre in diameter was uncovered. Nine weeks later dermatization was completed and the ear found absolutely dry.

Eleven months after the first operation the left ear was operated upon radically, the attic wall was necrotic and the togmen over the entire antrum and aditus extending to the epitympanic space was absent.

For about 2 months she appeared to proceed slowly but steadily towards recovery. Then she became feverish, restless and vomited. The head was retracted, the pupils dilated and the right eye deviated slightly outwards.

On examining the wound, pulsations of the dura were absent and it was covered with thickly sprouting, dark-colored granulations.

Lumbar puncture was made, and the fluid found to contain pus and a large number of extracellular diplococci, having the appearance of pneumococci. Examination of the eyes showed double choked disk.

The diagnosis made was purulent otitic meningitis.

A hopeless prognosis was given, but it was decided to drain the interior of the dura. The left mastoid wound was curetted and enlarged. The lower portion of the squamosal plate of the temporal bone was removed, making an opening 3 by 3½ c. m. The dark-colored, bulging dura was incised and there escaped 1 to 2 drachms of purulent fluid which bacteriologically showed a mixed infection with staphylococci predominating. The wound was flushed with a hot saline solution and a plain gauze drain introduced between the brain-base and the dura.

As this measure brought about no improvement, the left ventricle was entered and 1½ drachms of purulent fluid removed, and by lumbar puncture, employed as a therapeutic measure, 40 c. c. of a grayish-white, turbid fluid withdrawn. Following this lumbar puncture a distinct improvement was noticeable, so two days later 30 c. c. of fluid were withdrawn, with still further improvement.

From this time on improvement progressed slowly and gradually. The intelligence cleared, the temperature gradually came to the normal, the rigidity of the spine and the retraction of the head disappeared. The eye fundus cleared, and although some trouble was experienced because of the protrusion of the brain substance through the dura into the mastoid wound, this was finally overcome by gradually increasing the pressure exerted by the external dressing and packing.

Campbell.

A Case of Acute Sepsis Beginning on the Third Day of an Attack of Acute Middle Ear Inflammation; Examination of the Sigmoid Sinus; Recovery.

DUNN, Richmond (*Archives of Otology*, Vol. XXXV, No. 6). A young man suffered from left-sided earache for three days, then had a severe chill with high temperature. Next morning his fever was gone, but it rose again that evening and had continued for three days when the author first saw him and found him in a semi-stupor. He was sweating profusely and complained of much pain in the left ear. There was no soreness over the mastoid nor over the jugulars. The M. T. was opened, but only serum and blood escaped. On opening the mastoid, fetid pus was found in the antrum. The sinus was bared and found normal. The temperature con-

tinued high. He complained of pain in his right side and there, two days later, symptoms of lobar pneumonia were detected. From this time on the course was that of an acute pneumonia. *Campbell.*

On the So-Called Cyclic Course of Acute Otitis Media.

KOERNER (*Archives of Otology,* Vol. XXXV, No. 6). Zaufal claimed that a typical case of acute otitis media maintained a high temperature, lasting several days, with a subsequent sudden drop such as occurs in pneumonia. This the author has never observed, but in a few cases of otitis, with such a temperature curve, he has always discovered a more or less latent pneumonia. Preysing has called attention to the fact that pneumonia occurs with otitis very frequently in childhood and almost constantly in nurslings.

Koerner gives in detail the histories of three cases of otitis media in children with simultaneous pneumonia which at the beginning was latent. *Campbell.*

The Differential Diagnosis in Otitic Sinus Thrombosis.

Voss, Riga (*Archives of Otology,* Vol. XXXV, No. 6). In the pronounced pyemic form of sinus thrombosis with enlargement of the spleen, malaria must be considered. In pyemia as well as septicemia the spleen is soft, whereas in malaria it is a hard, palpable organ. Occasionally, in case of a splenic infarct, one meets with a hard palpable spleen as a symptom of sinus thrombosis, and here one must exclude malaria by the absence of malarial organisms and the negative result of quinine treatment.

In septic endocarditis the same symptom complex is present as in sinus thrombosis, but examination of the eyes in the former condition reveals hemorrhages in the conjunctiva and retina. In cases of tuberculosis, pneumonia and typhoid fever, differential diagnosis must be made by the symptomatology and by examination of the blood and expectoration.

Campbell.

Some Remarks on the Radical Mastoid Operation for the Cure of Chronic Suppuration of the Middle Ear.

SEYMOUR OPPENHEIMER (*New York Medical Record,* March 16, 1907). After a careful review of the indications for the radical mastoid operation, which are those accepted by otolo-

gists in general, the author gives some of the possible results which may prove unsatisfactory to the patient, namely: the operation is not without danger even in the otherwise healthy individual, and is a trying surgical procedure, often incapacitating the individual for a long period of time. There is no surety that the hearing will improve following it, and even with the operation apparently carefully performed, a purulent discharge may still continue; owing to a progressive osteomyelitis, the facial nerve may be injured or the semicircular canal. There is also possible danger of injury or removal of the stapes and the exposing of the internal ear to the dangers of serious infection, but he does not regard all these as so great a danger as the presence of a continual focus of suppuration in the temporal bone. As to the important question of hearing, which strongly influences the action of the patient, where tests show that the hearing is already seriously impaired and the labyrinth is involved, nothing will be gained so far as the hearing is concerned by this operation, but where the inner ear is normal and the patient can hear ordinary conversation fairly well, the majority of cases operated on show no further impairment of auditory acuity, but rather an improvement. A small number of individuals will show a continued loss of hearing following the operation.

Richards.

Tuberculosis of the Middle Ear and Mastoid.

E. A. CROCKETT, Boston (*Journal of the A. M. A.*, Oct. 20, 1906), believes that no matter how severe the tuberculous infection, the bone lesion limits itself very easily and if the process is attacked wherever it may manifest itself, ultimate result may be obtained, provided the knife is resorted to freely and frequently and that the prognosis of tuberculous process in the neighborhood of the ear is fully as favorable in infants, if not more so, as the prognosis of the ordinary septic process commonly causing mastoid diseases in children. The usual auxiliary methods of treatment in use in tuberculosis in general are, of course, demanded. He thinks tuberculosis of the ear more common than has been generally reported, and that cultures taken with especial reference to the bacillus of tuberculosis as a routine measure in a large series of cases will show a large number of such infections, which clinically show no diagnostic symptoms. *Richards.*

Influenza; Mastoid Abscess; Leptomeningitis; Nine Day Unconsciousness; Three Operations; Death.

H. BROOKER MILLS and NATHAN G. WARD, Philadelphia (*Medical Record,* March 9, 1907). In this case there was an attack of influenza followed by mastoid abscess, suppuration and necrosis in the ethmoid; relief of the symptoms except headache after operation; sudden development of violent pain in the head, with unconsciousness for nine days, high remittent temperature, meningitis, pus in the cerebral ventricles, death. The autopsy showed purulent leptomeningitis with ventricles widely distended with thick, greenish pus. *Richards.*

The Clinical Value of the Differential Blood Count in Operative Otology.

JAS. F. MCKERNON (*N. Y. Medical Journal,* January 19th, 1907) bases his observations on a study of 166 cases, of whom 108 were adults. After analyzing these cases, he reached the following conclusions:

The conclusions arrived at by a study of these cases are that in septic cases, and particularly when distinct symptoms and physical signs are absent, the differential blood count is of practical value in enabling us to complete a diagnosis, and in cases of sepsis, when the physical signs and symptoms are distinct and definite, it is then only confirmatory of what is already present, and gives us an added link to complete the chain of evidence.

In doubtful cases, when a differential count is taken and found to be negative, other daily counts should be taken, in order to verify or disprove that which has formerly been taken. Another fact of importance brought out in this series of cases is that when cellular bone structures, like the mastoid bone, are involved in a septic inflammation, without involvement of the adjacent blood currents, we find that in the majority of cases the differential count shows a relatively lower polynuclear percentage than when a septic process is present in the soft tissues of the body. This can be explained on the theory that an absorption of toxins is less rapid when such a process takes place in a bone cavity, than when the soft tissues of the body are involved, for in a number of the cases operated on, an abundance of pus was found, when the count showed a polynuclear percentage of between 72 and 80.

Harris.

Otology in Its Relation to the General Practitioner.

GORHAM BACON (*N. Y. Medical Journal,* December 22nd, 1906). In Bacon's opinion, the most serious cases among children are those that have little, if any, pain but whose chief condition is high temperature. He calls attention to the probability, in cases of scarlet fever and measles, that sudden rise of temperature is due to an extention to the diseased ear. In his experience, mastoiditis is not as serious a complication in scarlet fever as with measles. He has seen several serious cases following measles. Here, an osteomyelitis has developed which is almost certain to be followed by meningitis. He attaches great importance to the character of the microorganism found in the ear pus and lays weight also on the value of the blood-count. In regard to chronic otorrhea, he takes a conservative view and does not think it necessary to operate radically in all cases, referring to one case where such an operation had been advised but had been cured after removing the granulations by using the syringe. In his opinion, the percentage of fatal cases of chronic otorrhea among private patients is very small, and he has had but one case, viz., a brain abscess, during his entire practice. It is from the hospital cases that the statistics are compiled, and we all know how the poor neglect treatment unless compelled to come on account of pain, foul smelling discharge and dizziness. In chronic otorrhea the surgeon should, in his judgment, distinguish between the operative and non-operative cases, and he should never unnecessarily alarm the patient by advising an immediate operation, until he has made a through examination and satisfied himself that the case is an urgent one, and cannot be cured by conservative methods.

The Treatment of Chronic Suppuration of the Middle Ear.

EDWARD BRADFORD DENCH (*N. Y. Medical Journal,* May 4th, 1907) believes that when granulation tissue returns immediately after removal followed by proper irrigation there is diseased bone behind it and mild measures of treatment will prove useless. He does not attach any value to applications to the mucous membrane. He calls attention to the danger of recurring attacks in chronic middle ear suppuration because of the possible grave conditions behind it. Although a strong advocate of ossiculectomy, having had as high as 75 per cent of cures, he has now abandoned the operation on the grounds

that the conditions met with, even in mild cases operated on, are frequently so much more extensive than one would think. He describes the technic which he employs in the radical operation. He is a strong advocate of the skin graft, believing in a primary grafting when possible. With his improved technic he secured over 85 per cent of cures, with only three secondary operations, out of a series of 250 cases. He does not attach any importance to the possibility of fatal results following the operation, believing they are due to conditions existing before the operation. In his series of cases, the hearing has been made worse in only a few instances, and in the others it has remained the same as before the operation, or has been improved. *Harris.*

II.—NOSE.

A Statistical Report of the Results of Operations in Sarcoma of the Nose by Methods Generally Adopted, with a Plea for the More Extended Use of the Electro-Cautery in Suitable Cases.

J. PRICE-BROWN, Toronto (*Canadian Practitioner and Review*, 1906), has collected the statistics from fifty-one operations on sarcoma of the nose, with 14 recoveries, or 27 per cent.

His own cases consist of four patients with intranasal sarcoma, ages respectively eighteen, twenty, fifty and fifty-eight years, all of them operated upon with the galvano-cautery intranasally. Three of them are still living, having been operated on, respectively, eleven years, three years, and four years previously. The fourth case died of septic infection, probably from absorption of ptomaines from the sarcoma, but death did not occur until some time after the apparent removal of all of the growth.

The method consists in the free use of cocain and adrenalin, producing as much anemia as possible, then making perpendicular incision with the electro-cautery knife at a high degree of temperature, down into the basal attachment of the growth so far as possible. At the next visit, one or two days later, the cauterized tissue is removed by snare or forceps, the parts cleansed by sprays, and the operation repeated. Thus, successively, piece by piece and day by day, with the electro-cautery blade at almost a white heat, the sarcomatous tissue is dissected away. He thinks that in many of these cases a

cure can be accomplished by thorough and careful and painstaking treatment; and that even in cases usually considered inoperable, great and beneficial relief can be secured to the patient by the same means. *Richards.*

Osteomata of the Frontal Sinus.

GERBER (*Archives Internationales de Laryngologie,* January, 1907). Osteomata resembles fibromata of the nasopharynx in that they are at once benign and malignant. Histologically, they are benign. Osteomata are comparatively rare. Gerber has collected records of 84 cases. He regards, in cases of doubt as to the diagnosis, a pushing of the eyeball forward, outward, and downward as pathognomonic of all tumors of the frontal sinus, whatever their nature. When the eyeball is pushed forward only, it points to a tumor of the sphenoid or orbit; protusion outward, a tumor of the ethmoid.

The etiology of these tumors is obscure. Two theories are usually held—traumatism or some embryonic defect. After considering the arguments in favor of both of these theories, the author insists, in spite of attempted histologic differences:

First, that osteophytes, exostoses, and osteomata, all spring from the bone or periosteum without our being able to establish a difference between them.

Second, that osteophytes and exostoses of the frontal sinus are not rare.

Third, that ostitis and periostitis of the frontal sinus are not rare.

He further observes that, in spite of assertions to the contrary, multiple osteomata are met with, and, further, as a proof against the embryonic development i. e., that these two must always proceed from the ethmoid—that in eight cases at least, they had nothing to do with the ethmoid, and that in numerous cases where the tumor did arise from the ethmoid, it could have arisen as easily from the periostium as from the cartilage. As regards the etiology, he concludes as folows:

First, that the frontal sinuses have, more than any other part of the osseous system, a marked tendency to be the seat of bony tumors.

Second, that the majority of the time these are small circumscribed exostoses, osteophytes or hyperostoses which exist unrecognized throughout life.

Third, that at times we meet with osteomata of more considerable size, usually single, rarely multiple, which become dangerous by the compression which they exercise upon the orbit and contents of the skull.

Fourth, that they are wont to produce their maximum of intensity during the stage of formation of the bone and during the development of the frontal sinuses. That is why we observe them most often between the ages of ten and thirty.

Fifth, that the masculine sex is more often attacked.

Sixth, that the development of the tumor does not always extend over from year to year.

Seventh, that under proper operative procedure the prognosis is favorable.

The author concludes by reporting two cases of his own.

Harris.

A Contribution to the Study of the Etiology of Nasal Obstruction.

ROTH (*Revue Hebdomadaire,* January 20th, 1906) describes a group of cases where the only symptom complained of is pain in the superior maxilla bone. All that would suggest an inflammation in the nose, such as secretion or swelling, is lacking. Only by means of the exploratory puncture of the antrum is it discovered that there is disease in the antrum, the syringe bringing away a thick secretion which the patient was unable to blow away. He believes that in all cases of obstructed breathing, where no cause can be discovered in the nose or throat, the antrum should be explored. This inflammation of the antrum, which is of a catarrhal nature, can produce a unilateral nasal obstruction which is in the nature of a swelling of the cavernous tissue of the turbinals. This latter condition Roth has recently seen in three cases. This at once cleared upon washing out the antrum. He thinks that the swelling is here of a reflex nature.

Harris.

Some Mental Symptoms Due to Disease of Nasal Accessory Sinuses.

J. A. STUCKY, Lexington, Ky. (*Medical Record,* Nov. 24, 1906), reports eleven cases of nasal accessory sinus trouble in which the mental symptoms were marked, the ethmoid cells having been involved in all of the cases. The paper is a contribution to rapidly increasing literature of ethmoid trouble,

the appreciation of which and the treatment for which will result in the cure of many obscure cerebral conditions.

Richards.

Remarks on Endonasal Surgery.

A. B. THRASHER, Cincinnati (*The Lancet-Clinic*, April 13, 1907), regards the lower turbinate as standing as a protecting sentinel at the gateway to the lungs, and not to be sacrificed except as an urgent necessity. *Richards.*

Further Studies in Nasal Therapeutics.

JOHN A. THOMPSON, Cincinnati (*Lancet-Clinic*, March 23, 1907). Eczema in the vestibule of the nose is treated with an ointment containing a dram each of borax and boric acid in an ounce of vaseline. This so softens the crusts that they can be removed without pain or bleeding.

Purulent rhinitis of children is treated with the same remedy, used liberally in the nose at bed-time, applied when the child is lying down. Stearate of zinc and subgallate are indicated as protective powders after operations. *Richards.*

A Case of Rhinoscleroma Treated with the X-Ray.

MILTON J. BALLIN (*N. Y. Medical Journal*, March 16th, 1907) speaks briefly of the etiology of the disease, referring to the fact that Frisch in 1882 discovered a bacillus which he regarded as the causative factor. It occurs chiefly among the Russians, especially those in Galicia, and it is not contagious. It develops in both sexes. Up to the present time, the prognosis has been very unsatisfactory. His patient was a woman of fifty-three years and a Russian. The disease had lasted for sixteen years. Ulcerations of the pillars of the pharynx had been followed by large linear cicatrices. The uvula had disappeared. The microscope confirmed the clinical dagnosis. For four years she had been having pronounced tumefaction of the nose. The nasal passages were entirely occluded. The X-Ray, employed for a period of five months, had worked a most pronounced change, the nose being reduced almost to its normal size. The treatment was carried out with short exposures, but with currents of high frequencies—three sittings a week—a period of three to four minutes. There has been

no improvement in the nasal respiration. The larnyx was not involved. At the same time that the author's case was presented, a similar case also favorably treated by the X-Ray was shown. *Harris.*

The Radical Operation for Empyema of the Antrum of Highmore.

L. RETHI (*N. Y. Medical Journal,* February 9th, 1907) claims precedence for performing the intra-nasal operation in disease of the antrum of Highmore, referring to the fact that he described the operation in 1901. His operation is different from Claoue's in that Claoue's operation is in the inferior meatus, while he opens both in the inferior and the middle. He believes in a large opening, as otherwise there would be in his judgment trouble through closing in after-treatment. He removes the anterior two-thirds of the interior turbinated at the time of the operation and the external wall with a chisel pressed upon by the hand. The operation is rendered painless by the use of cocain, and he rarely is compelled to resort to general anesthesia. He states that he takes not more than fifteen minutes for the entire proceeding. He reports thirty-two cures out of thirty-eight cases operated upon.

Harris.

III.—MOUTH AND PHARYNX.

Diseases of the Nasopharynx in Infancy.

JOHN L. MORSE, Boston, Mass. (*Boston Medical and Surgical Journal,* April 18, 1907). This is a most valuable review of the diseases of the nasopharynx in infancy, from the standpoint of the pediatrist.

The nose is relatively small and the respiratory portion very small. The height of the posterior nares at birth is from 6 to 7 mm., and the breadth between the pterygoid processes at the hard palate 9 mm. The nasal cavity is relatively long and shallow, and the respiratory portion is very narrow, the whole opening of the posterior nares on either side being just large enough to admit the end of a medium-sized male catheter. After birth the cavity increases in height directly, rapidly during the first six months but slowly during the rest of infancy. The size of the posterior opening doubles in six months, after which it remains stationary until the end of the second year.

At the end of the seventh month the nasal cavity begins to approach the adult shape, although still relatively broad. The nasopharynx is very low at birth, but relatively long from before backward, the distance from the hard palate to the soft parts at the back of the pharynx being nearly as great at birth as in the adult. The soft palate is placed more horizontally than in the adult.

The Eustachian tube is nearly horizontal at birth, but slants a little during the latter part of infancy. The tube is not only relatively but absolutely wider at its narrowest point at birth and during infancy than in the adult, which explains the ease with which catarrhal processes travel to the middle ear in infancy.

The connective tissue between the pharynx and the spine is very lax. The nasopharynx is extremely vascular, and there is an abundant supply of lymphatic glands and vessels, especially in the posterior wall. Retropharyngeal lymph nodes form a chain on both sides of the median line of the pharynx, extending from its upper portion to its junction with the esophagus. They lie between the prevertebral aponeurosis and the muscles of the pharynx. The lymphoid ring is often well developed at birth and even more so during infancy.

Acute rhinitis, or the common cold, is very common in infants, and is sometimes a fatal malady, especially in the early months, the symptoms being broken sleep, oral respiration, elevated temperature, often very high, loss of weight and strength. The treatment is local and general, the latter being merely supportive. Liquid albolene or albolene combined with menthol and camphor in the proportion of one grain of each to the ounce is the most useful local application. It is best introduced with a dropper, with the infant on its back. He regards acute rhinitis as contagious, hence babies should be kept away from adults and older children suffering from colds.

He has found diphtheritic rhinitis rather common in children, and at the Boston Infants' Hospital every nasal discharge in an infant, if irritating, is suspected of being diphtheritic, so that as a routine all babies now receive 50 units of antitoxin on admission and every three weeks afterwards. This has been practiced for six years, since which time but one case of pharyngeal diphtheria has developed in the patients in the hospital, although many unimmunized nurses and nursery maids have come down with it and many cases of diphtheria have

been discovered. A thin, watery nasal discharge which irritates the lip, should in an infant always be regarded with great suspicion and the discharge be examined bacteriologically. The membrane is very hard to find, and unless the speculum is used is never visible and even then may not be seen. The diphtheritic process does not extend downward and backward to the pharynx and larynx. Alkaline washes are used, introduced with a dropper or syringe. Strong antiseptic solutions should not be used.

Adenoids: These are far more common in young infants than the general practitioners or even the laryngologists have supposed, and the evil results which they produce are greater in infancy than in childhood. He has found a general feeling, even among larynoglogists, that adenoids should not be removed in infancy because they are likely to recur later. With this feeling the author entirely dissents, for the reason that in the majority of cases the adenoids do not recur, and even if they do, there is no reason why the baby should be subjected during the interval to all the evils which adenoids produce when they might be avoided by early operation. On account of the small size of the superior pharynx and postnasal opening even a small amount of adenoid can cause marked obstruction in nasal respiration.

Rickets is especially prone to develop in these cases, and considerable deformities of the chest are sometimes produced. A series of cases are cited showing the results of adenoids in infants and the improvement after removal. They are one of the commonest, if not the most common, cause of chronic "snuffles" in infancy. They are always present in those babies that are subject to frequent colds in the head. The fact that the baby does not keep its mouth open or snore at night or have the typical facies of adenoid in later childhood should not allow one to overlook the adenoid symptoms, but be on the lookout for them when they are present, since the frequent colds and chronic snuffles are almost as suggestive and characteristic of adenoids in infancy as these more marked symptoms are in childhood. Adenoids should also always be thought of when babies sleep poorly.

Pharyngitis is common in infants. Glycerite of tannin applied locally is found to do more good than anything else, drugs internally having proved useless.

Retropharyngeal abscess is often overlooked and can only be diagnosed in the early stages by palpation. No examina-

tion of an infant's pharynx should be considered complete until the area has been palpated with the finger. Unwillingness to take food, difficulty in swallowing, difficult breathing except in the upright position, laryngeal cries, stridulous respiration, high temperature, are the characteristic symptoms. These symptoms are, however, frequently misinterpreted, since the condition is not considered even in the differential diagnosis. When the diagnosis is made incision should be performed with the infant in the upright position, with a guarded knife. A gag should not be employed because of the danger of sudden death from its use. (The author does not mention the question of anesthesia, but as several deaths are on record from the use of anesthetics in retropharyngeal abscess, the reviewer thinks anesthesia should never be used for the same reason that the mouth gag should not be, namely: on account of the danger of some disturbance of the vagus from the effects of the anesthetic or the pressure of the mouth gag.) The incision should be made in the mouth and not externally, and enlarged with the finger.

Otitis media. He has found this very frequent in infancy and often overlooked on account of the general misapprehension as to the symptomatology of the disease at this age. Physicians are constantly on the lookout for earache and tenderness over the mastoid, and when these are not present, rule out trouble in the ear without further investigation. Many infants with acute inflammation of the middle ear show no sign of pain at any time, and many others who evidently have pain somewhere, show nothing by their actions that attracts the attention of the physician to their ears. Babies with earache rarely put their hands to their ears. The symptoms of earache are sharp cries, restlessness and inability to sleep. Tenderness over the mastoid on pressure is a very unreliable guide. On account of the undeveloped condition of mastoid cells, mastoid inflammation is rare in infancy. In most of the cases of otitis media there are no symptoms which attract direct attention to the middle ear. High fever is usually an accompaniment, though not always. Infants with fever and obscure symptoms should always be examined as to the condition of the middle ear and drum membrane. A series of cases showing various types of otitis media in infancy are given, in several of which the symptoms were unusual and misleading, all pointing to some obscure cerebral condition,

either acute or chronic, in which mistakes in diagnosis were made by several competent gentlemen, but in which all the symptoms disappeared after incision of the drum membrane.

The author thinks the ear should be examined in every acute illness in infancy, and every practitioner should become conversant in the examination. A smaller speculum than comes in most sets is necessary. The importance of the patency of the petrosquamosal suture in infancy as favoring the extension of inflammation from the middle ear to the meninges has been much overestimated, and can to all intents and purposes be disregarded. *Richards.*

The Diseased Faucial Tonsil as a Causative Factor in Respiratory and Gastric Diseases.

DR. SOLENBERGER (*New York Medical Journal,* September 15, 1905). A further contribution to the voluminous literature on this important subject. The writer is an ardent believer in the far-reachng evils from the so-called tonsil. He does not recommend the cold wire snare for their removal, because of the difficulty of application and incompleteness of the result. In his opinon cutting instruments, such as scissors, are accountable always for hemorrhage, and on this account are never to be employed. His preference is for the tonsil punch, which, if properly constructed, as are the Myles or Freeman punches, will give most satisfactory results.

Harris.

The Relation Between Disease of the Tonsils and Enlargement of Glands of the Neck.

CAMPBELL (*New York Medical Journal,* May 1st, 1907). After referring to the anatomic structure of the tonsils, the author gives a resumé of the recent investigations on the lymphatic system of the neck. In acute infectious diseases, the glands enlarge some days before the onset of active symptoms and, in his judgment, are reliable indications that such diseases are incubating. Nursing infants are not prone to contract infectious diseases, due probably to the small size and active conditions of the tonsil. The apparently healthy tonsil does not prevent the passage of virulent tubercle bacilli through its substance. He quotes Bandelier, who has summarized the principal communications regarding the tonsil in tuber-

culosis, giving details of 100 cases where the tonsils were enlarged and tubercular among 900 patients suffering from general tuberculosis. The tonsils of the adult are seldom the entrance point of tubercular infection. He concludes by saying it would be well were the truth more generally recognized that diseased tonsils are in themselves not only perilous to the individual, but a great menace to the glands and contiguous parts which are so very susceptible to disease. If tonsils and adenoids were more often removed, infectious diseases, including tuberculosis, would be more infrequent.

Harris.

Acute Edema of the Pharynx, with Report of a Case Requiring Rapid Tracheotomy.

GOETHE LINK, Indianapolis (*Medical Record*, March 2, 1907), reports a case of severe edema of the pharynx accompanying tonsillitis, in which an emergency tracheotomy was done, and in the absence of any tube other than a silver female catheter and a hard rubber vaginal syringe, he used the former for an emergency tube at the time of the operation and then used the hard rubber vaginal syringe tip, previously whittled to fit the tracheal wound, for the permanent breathing. The edema rapidly subsided and recovery promptly occurred. *Richards.*

IV.—LARYNX, TRACHEA AND ESOPHAGUS.

Primary Laryngeal Tuberculosis.

MANASSE (*Fraenkel's Archiv.*, Bd. XIX, Heft 11, 1907). According to Schech, laryngeal tuberculosis, in rare instances, may occur primarily, without previous or existing tuberculous disease of other organs. Both Chiari and Schech, however, have been able to find only four cases of primary tuberculosis of the larynx based on autopsy findings.

The author reports another case: Mrs. M., aged 55 years, developed pain in the throat four weeks before coming under the author's observation. Dyspnea had been present for eight days. On examining the larynx, the mucous membrane was found to be reddened, with some infiltration of the vocal cords and ventricular bands. During quiet respiration, a subglottic swelling of the tracheal mucous membrane could be

seen, which occluded the lumen of the trachea very much. The vocal cords approximated perfectly. The dyspnea increased to such an extent that tracheotomy had to be performed, after which breathing became easy. Patient died suddenly a week after the operation. The autopsy showed a fibrinous coating of both lungs and a cloudy exudate in the left pleural cavity. The mucous membrane of the bronchial tubes was extremely reddened, but free from cicatrices and ulcers. The small bronchi were considerably dilated and contained a thin purulent secretion. No old tuberculous lesions were found in the lungs. Microscopical evidence of tuberculosis was found in the larynx. There was a circumscribed tuberculous process of the lower half of the right vocal cord, with perichondritis of the cricoarytenoid articulation. The case was of interest because the autopsy proved that all other parts of the body were free from tuberculous changes, so that this must be considered a case of primary tuberculosis of the larynx.

Theisen.

Tracheal Diphtheria with Recurring Formation of Pseudo-Membrane.

H. Herzog (*Deutsch Medicinische Wochenschrift*, May 16, 1907) had occasion to observe three times in a severe case of diphtheria an "ecouvillonnage" of the larynx.

In 1896 Variot and Bayeux, described under the term "ecouvillonnage" a new procedure in the treatment of laryngeal diphtheria.

The method consists in the passing of the tube, just as in the ordinary intubation. The tube which loosens the membrane clinging to the walls of the larynx and trachea, is removed in a few minutes, however, and the detached membrane is coughed out.

In the following case, described by the author, the patient coughed out the tube with a membranous cast of the trachea three times.

J. B., aged 2¾ years. Had measles four weeks before coming under the author's observation. Coryza and a hoarse cough for a week with suffocative attacks for several nights. On examination, an extensive membrane was observed on both tonsils. The nose was clear. Intubation was performed within a half hour after the patient was admitted to the hospital. The tube could be easily introduced, but was coughed

out after a few seconds, covered with a membrane which covered it like the finger of a glove.

The membrane showed the impressions of the tracheal rings.

Ten hours after the first intubation, urgent symptoms demanded a second one. The tube was again coughed out at once, and was covered with the same kind of membrane.

Fourteen hours later another intubation had to be performed and the same thing happened. The same tube-like membrane was coughed out.

The further history of the case is of no great interest. The patient made a complete recovery.

The use of antitoxin did not prevent the regeneration of the membrane in the trachea which occurred twice in twenty-five hours, but the ease with which the membrane was thrown out was undoubtedly due to the action of the serum.

Theisen.

Thyrotomy and Laryngectomy for Malignant Disease of the Larynx.

CHEVALIER, JACKSON (*British Medical Journal*, Nov. 24, 1906) has performed fifteen thyrotomies for malignant disease of the larynx. The age of the patients varied from 33 to 81 years. All of the fifteen cases were males.

Site.—Left ventricle in three cases; right ventricle in two; left ventricular band in one; right band and ventricle in one; left cord in one; left cord and ventricle in one; right cord in three; both cords (anterior commissure), in one; interarytenoid fold in one; aryepiglottic fold in one.

All of the growths were small in size, the largest not much exceeding a cubic centimetre, and the smallest rather smaller than a pea. Histologically, twelve were squamous-celled epitheliomata, one was scirrhus, one glandular-celled carcinoma, one sarcoma.

Recurrence.—Of fifteen thyrotomies for malignant disease performed by the author, one is too recent for record. Of the remaining fourteen, one was alive and well at the end of six years, one at the end of four years, two were alive and well at the end of three years, one at the end of two years. Two died of general diseases after one year, 4 were lost trace of at the end of about one year, and 3 died of local recurrence in spite of subsequent laryngectomy. Of the 14 thyrotomy cases, 11 or 78 per cent, were well at the end of one year, at which period the author believes the term relative cure may be applied.

In considering the subject of total extirpation of the larynx, for malignant disease, the author states, that while thyrotomy is the operation of election for early intrinsic malignant disease, laryngectomy should be performed in certain selected cases of extrinsic cancer, if the patient's general condition warrants it. Out of 29 cases of extrinsic malignant disease of the larynx observed by the author, total laryngectomy was done in eight. These eight patients were in good physical condition. The age ranged from 52 to 75 years. All eight cases were males. Of the eight cases, six were epitheliomata, one was a columnar-celled carcinoma, and one of mixed type—an endothelial sarcoma.

Site.—Aryepiglottic fold in 1; aryepiglottic fold, epiglottis and arytenoid in 1; interarytenoid fold and posterior surface of the cricoid in 1; right half of the larynx in 2; left half of the larynx in 2; posterior half of the larynx in 1.

Recurrence.—Of the eight total laryngectomies performed by Jackson, three were hemilaryngectomies followed by recurrence and the total operation. Of the eight laryngectomies, one lived 7 years, one lived 3 years without recurrence, dying of cerebral hemorrhage, and one eight months, dying of alcoholism. Of the remaining five, three recurred within a year, one apparent cure was lost to observation after a year, and one is too recent to record. One of the three prompt recurrences had metastases in the lungs, liver and pancreas. Thus, of eight laryngectomies, no absolute ultimate cures can be claimed, though three were apparent cures at the end of one year.

The author then considers the technic of the operation and concludes as follows:

1. Thyrotomy is the operation of election for early intrinsic laryngeal malignant disease. Until a therapeutic cure shall have been discovered, surgery cannot hope for better results than this operation yields, if done only in intrinsic disease of very limited extent.

2. Laryngectomy is advisable in all cases extrinsic by origin or extension, provided the patient is in vigorous health.

3. There is no such thing as absolute ultimate cure of malignancy. Recurrence may take place after many years. For the purpose of comparing the relative efficiency of operative methods, freedom from recurrence for one year indicates adequate removal. Varying periods thereafter indicate vary-

ing degrees of malignancy or varying degrees of vulnerability; not repullulation of the primary process from operative inefficacy. If cancer can reappear in the stomach seven years after removal of the cancer of the larynx, there is no reason why it should not appear in the neck of the scar, where it would be called a "recurrence" rather than a "reinfection."

4. No operation other than a palliative one is justifiable in a patient of feeble general health, nor in one in good condition if he have metastasis or organic disease. Hence, in only a few cases is operation justifiable at the time they come under observation.

5. If this rule be adhered to in the selection of the case, and a careful technic, preoperative and postoperative as well as operative, the mortality of laryngectomy can be reduced to a point where any surgeon will not hesitate to advise it. The mortality must always be considerable. It is not possible to reduce it to *nil*, and it is only so in this series by reason of the small number of cases.

Theisen.

Scleroma of the Larynx.

EMIL MAYER, New York (*American Journal of the Medical Sciences*, May, 1907), thinks this case is the first case of scleroma beginning *de novo* in the larynx to be presented and published in North America.

The patient was a Slav from Poland, 15 years of age, female, and well until three years ago. Became hoarse on the jonrney from Poland to America. The mass was subglottic below the right cord, protruding into the larynx, diminishing its lumen by about one-half, and had a grayish appearance. In the removal the masses were translucent, pale and resembling soft adenoid tissue. The pathological report was that of scleroma, and pure cultures of a mucoid, Gram-negative, capsulated bacillus, belonging to the Friedländer group were obtained from the freshly cut sterilized surfaces of the growth.

A study of the literature is given, and the conclusion reads that scleroma is a chronic, incurable affection, contagious to a certain degree. *Richards.*

V.—MISCELLANEOUS.

The Physiology of Language and Its Relation to the Treatment of Stammering.

HUDSON MAKUEN (*New York Medictl Journal,* December 29th, 1906) refers to the way that the subject of defects of speech has been neglected by regular teachers and practitioners of medicine. Its treatment in his opinion belongs to the laryngologists although he recognizes the neurological element. The nomenclature of defect of speech is in great need of revision. He defines stammering as a more or less constant inability to speak freely owing to an incoordinate and spasmodic action of the respiratory, phonetory, or articulatory muscles. He dwells on the prevalence of the affection; one per cent of all school children are affected and he explains the comparative absence in adult life, being due to either the death or dropping behind of its victims. Just as the English alphabet has 26 characters, so spoken language has its own alphabet of sound called the physiologic alphabet. Several such alphabets have been constructed, and the author gives one of his own. In his opinion, the use of such an alphabet constitutes the basis for the proper phonetory and articulatory treatment of stammering, and with it, the patient is taught to speak in exactly the same way as he was taught to read. This method should be pursued for several weeks to the exclusion of ordinary conversation. It does not develop a formal or stilted style of speech, as has sometimes been supposed. *Harris.*

The Treatment of Tuberculous Glands of the Neck by the X-Ray.

SIDNEY L. FELDSTEIN (*N. Y. Medical Journal,* January 5th, 1907), from a considerable experience, makes the following conclusions as to the value of the X-Ray in the treatment of the glands of the neck:

First, they should be treated by the X-Ray when no softening or caseation has taken place.

Second, softened or caseous glands should be referred to the surgeon, and ought not to have X-Ray treatment.

Third, postoperative X-Ray treatment is important if there is any doubt of remaining glands which might be infected.

Fourth, for cosmetic reasons.

Fifth, the size of the gland or glands does not influence the successful result of the treatment. *Harris.*